PB-231 535

# HAZE FORMATION: IT'S NATURE AND ORIGIN 1973

D. F. Miller, et al

Battelle Columbus Laboratories

Prepared for:

Coordinating Research Council

June 1973

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**BIBLIOGRAPHIC DATA SHEET**

1. Report No. CRC-APRAC-CAPA-6-68-4

2.

PB 231 535

3. Report Date June 1973

4. Title and Subtitle Haze Formation: Its Nature and Origin 1973

6.

7. Author(s) D. F. Miller, W. E. Schwartz, P. W. Jones, D. W. Joseph, C. W. Spicer, C. J. Riggle, and A. Levy

8. Performing Organization Rept. No.

9. Performing Organization Name and Address
Battelle, Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

10. Project/Task/Work Unit No.

11. Contract/Grant No.

12. Sponsoring Organization Name and Address
Coordinating Research Council, Inc.,30 Rockefeller Plaza, New York, N.Y. 10020 and U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711

13. Type of Report & Period Covered Second Year - 6/72-6/73

14.

15. Supplementary Notes

Not releasable to the public until April 1974.

16. Abstracts

This report covers field sampling and aerosol analyses of haze formation: its nature and origin. Field sampling was conducted in downtown Columbus during the latter half of July 1972, in New York City (Welfare Island) throughout August, and in Pomona, California, for 10 days in mid-November. The sampling involved continuous monitoring of the meteorological conditions and the gas-phase composition of the air concomitant with collecting aerosols and measuring visibility reduction due to light scattering. All aerosol samples were collected on a diurnal basis. Because this project is devoted to small particles which cause light scattering, samplers were equipped with size-fractionating devices which provided particle separation near 2 um diameter. An An analytical scheme was developed for determining the organic features of aerosols. The scheme not only provides qualitative information but also numerical data. Inorganic analyses were performed on aerosols selected from 22 of the 43 sampling days at the three sites.

17. Key Words and Document Analysis. 17a. Descriptors

Air Pollution
Inorganic
Organic
Aerosol
Particulate Matter
Carbon
Hydrogen
Nitrogen
Oxygen
Methylene Chloride

17b. Identifiers/Open-Ended Terms

Columbus, Ohio
Pomona, California
New York City (Welfare Island), New York

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U S Department of Commerce
Springfield VA 22151

17c. COSATI Field/Group 7B; 7C; 11D; 13B; 14B.

18. Availability Statement

Available to the general public

19. Security Class (This Report) UNCLASSIFIED

20. Security Class (This Page) UNCLASSIFIED

21. No. of Pages 160

22. Price $5.00

FORM NTIS-35 (REV. 3-72)

THIS FORM MAY BE REPRODUCED

USCOMM-DC 14952-P72

# HAZE FORMATION:
# ITS NATURE AND ORIGIN
# 1973

to

COORDINATING RESEARCH COUNCIL INC.
and
U.S. ENVIRONMENTAL PROTECTION AGENCY

June, 1973

by

D. F. Miller, W. E. Schwartz, P. W. Jones, D. W. Joseph,
C. W. Spicer, C. J. Riggle, and A. Levy

BATTELLE
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

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# SECOND YEAR REPORT
on
# HAZE FORMATION: ITS NATURE AND ORIGIN
to
COORDINATING RESEARCH COUNCIL INC.
(CAPA 6-68)
and
U.S. ENVIRONMENTAL PROTECTION AGENCY
(Contract No. 68-02-0276)
from
BATTELLE
Columbus Laboratories

June 15, 1973

## INTRODUCTION

The objective of this project is to identify and analyze atmospheric haze in order to distinguish between photochemical haze from automotive sources and that from nonautomotive sources.

Historically, very little is known regarding the composition of atmospheric aerosols, particularly the composition of the organic constituency – an area where photochemical processes prevail in creating light-scattering aerosols. This program, currently in its second year at Battelle-Columbus, has been devoted to characterizing the composition of aerosols by adaptations of analytical techniques to microquantities and to the retrieval of detailed air-quality data simultaneously with aerosol collections. The report summarizes the results of research done in the period June 6, 1972, to June 6, 1973.(1) In consultation with the CAPA-6 project group, it was decided that the report contain a description of experimental methods, a complete presentation of experimental data, and a brief discussion of experimental findings, with no attempt being made to establish cause-effect relationships.

## SCOPE AND STATUS OF PROGRAM

The overall program consists of three distinct phases involving field sampling, aerosol analyses, and statistical and interpretive analyses. Work performed during this report period was limited to the first two phases.

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(1) Results of the first-year program are summarized in Battelle-Columbus' First Year Final Report to CRC and EPA, January 28, 1972.

PB 212 609

Field sampling was conducted in downtown Columbus during the latter half of July, 1972, in New York City (Welfare Island) throughout August, and in Pomona, California, for 10 days in mid-November. The sampling involved continuous monitoring of the meteorological conditions and the gas-phase composition of the air (including CO, NO, $NO_2$, $SO_2$, ozone, methane, ethylene, acetylene, and total hydrocarbon) concomitant with collecting aerosols and measuring visibility reduction due to light scattering.

All aerosol samples were collected on a diurnal basis. To provide the aerosol mass needed for organic analyses, three samplers operated continuously at 20 cfm, sampling 25 feet above ground level. Because this project is devoted to small particles which cause light scattering, the samplers were equipped with size-fractionating devices which provided particle separation (based on aerodynamic size) near 2 $\mu$m diameter.

An analytical scheme was developed for determining the organic features of aerosols. In addition to providing qualitative information concerning the broad chemical classes and functional groups present in the organic fraction of aerosols, the scheme provides numerical data, thereby permitting statistical treatment of organic compositional data together with data on air quality and inorganic composition.

Numerical organic data describe the weight-percent solvent extractable (methylene chloride and dioxane) components of the aerosols, weight-percent CHN in the extractables, infrared spectroscopic band intensities for specified absorptions, aromatic/aliphatic ratios (by NMR) and quantitative functional group analyses for total alcohol and total carbonyl in specified sample fractions. The scheme has been applied to six aerosol samples; two diurnal samples collected at each of the three sampling sites.

Inorganic analyses were performed on aerosols selected from 22 of the 43 sampling days at the three sites. The analyses included trace metals by optical emission spectrometry, Cl, Br, S, and Pb by X-ray fluorescence, and $SO_4^=$, $NO_3^-$, $NH_4^+$, and CHN by other chemical methods.

The third year of this program will initially be devoted to two activities: (1) detailed interpretation and modeling of the ambient air-quality data and aerosol analytical results currently available and (2) application of the organic analysis scheme to aerosols generated photochemically from auto exhaust. Depending on the outcome of these tasks, the completion of the third-year program will involve investigations among the following activities: (1) additional field sampling, (2) additional chemical analyses of aerosols from previous sites and/or a new site, and (3) a statistical analysis of the air quality and compositional data to identify relationships between aerosols and their sources.

## SUMMARY OF RESULTS

Although much of the significance of the data contained in this report will be brought out only through next year's work (third-year program), there are a number of observations regarding air quality and aerosol properties which stand out from only casual review of the data. Some of these observations are:

- Air-quality data taken at Welfare Island, New York City, indicate that the contribution of automotive exhaust emissions to the hydrocarbon burden in that area is <10 percent.

- Photochemical aerosol formation was quite moderate in New York in spite of the substantial development of other photochemical-smog manifestations, particularly ozone.

- A high, positive correlation was found between nephelometry data (light scattering) and aerosol mass concentration data for aerosols <2 μm in diameter.

- The chemical composition of aerosols <2 μm in diameter is vastly different from that of aerosols >2 μm in diameter.

- Organic compounds and sulfate compounds are major constituents of the <2-μm aerosols in Columbus, New York, and Pomona; in Pomona, nitrate compounds are also major constituents in that size range.

- In the size range >2 μm, most of the aerosol matter comprises carbonate and metallic compounds. Lead and zinc compounds, however, were predominantly in the <2 μm size range.

- A dual-solvent extraction procedure was necessary to extract organics from aerosols (<2 μm) having wide ranges of polarity and solubility.

- Correspondence has been observed between results of CHN analyses and those of infrared spectroscopic analyses. For example, there is an apparent correlation between the weight percent nitrogen in the organic sample and the relative intensity of tentatively identified nitrate bands.

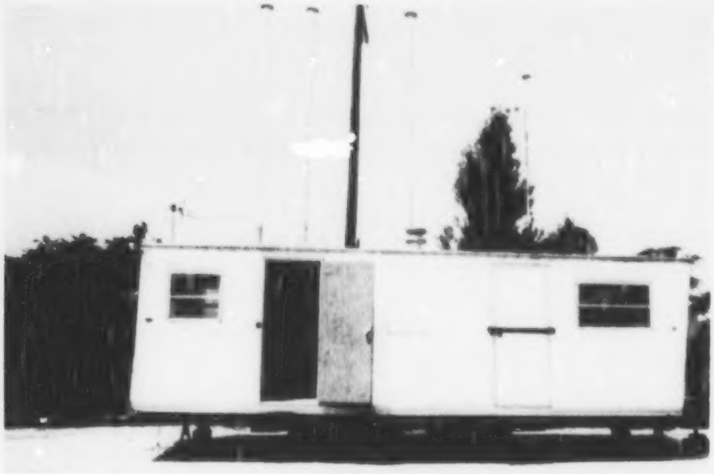
- The techniques adapted for micro-functional-group analyses provide unambiguous molar values for alcohol and carbonyl content of specified sample fractions.

## EXPERIMENTAL METHODS

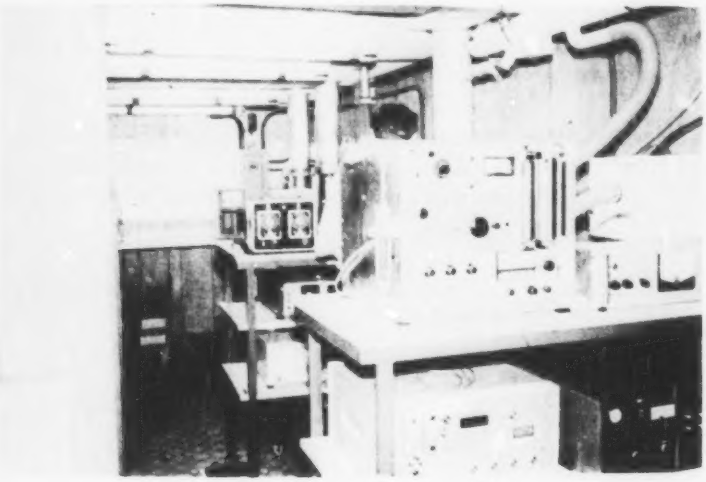
### Air-Quality Measurements

Battelle-Columbus' Mobile Air-Quality Laboratory, pictured in Figure 1, was used in Columbus and New York to monitor meteorological conditions, integrated light scattering, solar-irradiation intensity, and the gas-phase composition of the air while simultaneously collecting aerosols for chemical analyses. In Pomona, only the aerosol samplers were used; air-quality data were made available through the County of Los Angeles Air Pollution Control District and Brackett Field Airport, LaVerne, California.

Pertinent instrumentation used in collecting the data in Columbus and New York is indicated in Table 1.



a. View of Exterior



b. View of Interior

FIGURE 1. BATTELLE-COLUMBUS' MOBILE AIR-QUALITY LABORATORY

## TABLE 1. ANALYTICAL INSTRUMENTATION FOR AIR-QUALITY MONITORING

| Analysis | Instrument |
|---|---|
| Wind speed and direction | MRI, Model 1074-2 sensor |
| Temperature | MRI, Model 802 sensor |
| Relative humidity | MRI, Model 907 sensor |
| Global radiation intensity | Eppley Lab., Inc., 180° pyrheliometer |
| Light scattering | MRI integrating nephelometer |
| $O_3$ | REM, Model 612 chemiluminescence monitor |
| NO<br>$NO_x$<br>$NO_2$ (by difference) | Bendix, Model 8101-B chemiluminescence NO-$NO_x$ analyzer, gold/carbon catalyst converter |
| THC<br>$CH_4$<br>CO | Union Carbide, Model 3020 analyzer |
| $SO_2$ | Battelle-Columbus built; Tracor Instruments flame photometer detector |
| $C_2H_2$<br>$C_2H_4$ | Varian Series 1200 gas chromatograph |

The meteorological station was calibrated by MRI. The integrating nephelometer was zeroed and electronically spanned each day; a calibration with Freon 12 (Du Pont) was performed weekly.

Chemiluminescence instruments were used for monitoring $O_3$, NO-$NO_x$, and $SO_2$. The ozone instrument was calibrated against the wet chemical KI method(2) and a constant ozone source (McMillan Series 1000 ozone generator). Calibration was performed before and after monitoring periods. In the field, the ozone instrument was zeroed each day. A Hopcalite catalyst was used to destroy the ethylene effluent from the ozone instrument. The NO-$NO_x$ analyzer was calibrated daily using an NO span bottle whose concentration was determined using an NO-$O_3$ titration procedure.(3) Charcoal was used to destroy the $O_3$ effluent. The $SO_2$ (total sulfur) analyzer was calibrated using an $SO_2$ permeation tube (Metronics, Inc.) and appropriate apparatus.

The FID analyzer for total hydrocarbon (THC), $CH_4$, and CO was calibrated each day, using a span bottle of known CO and $CH_4$ concentrations. The $CH_4$ span concentrations were validated against other standards in the Battelle-Columbus laboratory.

Porapak N and Q packed columns were used to chromatograph $C_2H_4$, $C_2H_6$, and $C_2H_2$. Only the $C_2H_4$ and $C_2H_2$ areas were quantitated. The sample volume was 1 ml. With ultrapure hydrogen, 1 ppb C sensitivity was achieved. The same span bottle used for calibrating the THC-$CH_4$-CO analyzer was used to calibrate the gas chromatograph each day.

## Aerosol Collections

All aerosol samples were collected on a diurnal (23 hour) basis. To provide the aerosol mass needed for analytical purposes, three high-volume samplers operated continuously at 20 cfm. Samples were collected from about 25 feet above ground and directed through 6-inch-diameter aluminum stacks to the filters located within the laboratory (see Figure 1).

Because in this program the interest is primarily in characterizing the small particles that cause light scattering and are respired (particles having aerodynamic sizes $<2\ \mu m$), the samplers were equipped with size-fractionation devices. Andersen 2000 Inc. Hi-Vol impactor heads were used with two of the samplers and a cyclone was used for the third sampler. Particle fractionation with the Andersen heads provided particle precollection in the size range 7 $\mu m$ and above, 3.3 to 7 $\mu m$, and 2.0 to 3.3 $\mu m$ and backup filter collection of particles $<2\ \mu m$ in diameter. The configuration of the aerosol samplers and impaction stages is shown schematically in Figure 2.

It is estimated that, because of the design of the interface plate (Figure 2), about 50 percent of the particles in the size range 1 to 2 $\mu m$ were inadvertently impacted on this plate rather than being collected on the backup filter. However, the amount of aerosol thereby lost was apparently small compared with the total amount of material collected on the backup filter – as evidenced by the "nearly" identical mass loadings that were obtained using the cyclone sampler, which collected all particles $<2\ \mu m$ in diameter. Furthermore, if the size distribution of atmospheric aerosols analyzed in the Los Angeles area are representative of distributions in other

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(2) "Air Quality Criteria for Photochemical Oxidants", USDHEW-PHS, National Air Pollution Control Administration, Publication No. AP-63, Washington, D.C., March, 1970.

(3) Hodgeson, J. A., Baumgardner, R. E., Martin, B. E., and Rehme, K. A., Analytical Chemistry, 43 (8) (July, 1971).

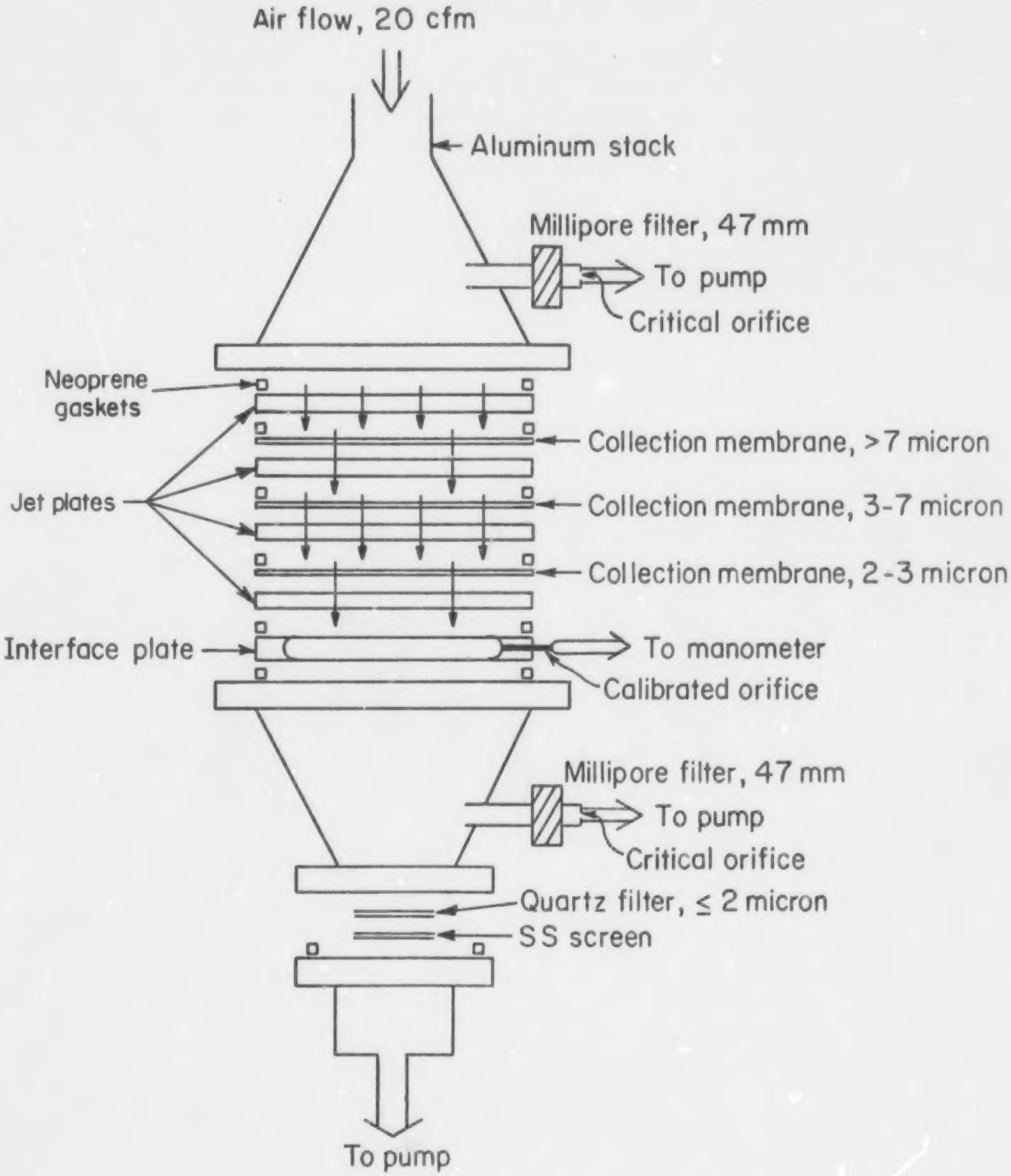

Air flow, 20 cfm
Aluminum stack
Millipore filter, 47 mm
To pump
Critical orifice
Neoprene gaskets
Collection membrane, >7 micron
Jet plates
Collection membrane, 3-7 micron
Collection membrane, 2-3 micron
Interface plate
To manometer
Calibrated orifice
Millipore filter, 47 mm
To pump
Critical orifice
Quartz filter, ≤ 2 micron
SS screen
To pump

FIGURE 2. SCHEMATIC OF AEROSOL SAMPLERS

urban areas, one might not expect that a substantial fraction of the particles <2 μm would have been lost owing to the design under consideration. According to the size-distribution study by Whitby[(4)], the aerosol volume associated with particle sizes of 1 to 2 μm is fairly small (~12 percent) compared with the total volume for aerosols <2 μm.

The third sampler incorporated a specially designed cyclone which served as a precollector for particles >2.0 μm. With all samplers, 6-inch high-purity quartz-fiber membranes were used as backup filters. In addition, two 47-mm Millipore filters were used to collect aerosols for metals analyses. These filters were located above and below the Andersen impactors, thereby providing samples of total aerosol and aerosol <2 μm diameter.

The mass gain on each filter was determined gravimetrically with a Cahn electrobalance. The filters were equilibrated to a constant humidity (30 percent at 25 C) before and after weighings; 24 hours were allowed for equilibration.

### Aerosol Inorganic Analyses

Four analytical methods were used to analyze the inorganic constituents of the aerosols. A brief description of each follows:

- **Optical emission spectrometry (OES)** was used for determining traces and major elemental distributions on membrane filters (Millipore cellulose). The filter and sample are ashed by burning in ethyl alcohol which, by moderating the combustion, prevents sample loss. The ashed product is mixed with graphite and shot by the DC-arc technique.

- **X-Ray fluorescence (XRF)** was used for determining Pb, S, Cl, and Br. Aerosol samples collected on quartz fiber were subjected directly to the XRF method, and the collected intensities were compared with those of secondary standards consisting of simulated samples previously analyzed by other methods.

- **Wet-chemical analyses** were used for inorganic ions collected on quartz tissue. Upon extraction in water, sulfate ions were precipitated as barium sulfate and weighted quantitatively. Ammonium ions were determined by distillation and titration. An aliquot was treated to reduce nitrate ions to ammonia which was treated as described for ammonium only. The difference of the two titrations corresponds to the nitrate ion.

- **CHN elemental analyzers** were used to determine CHN by pyrolysis of the sample and subsequent detection by thermal conductivity.

---

(4) Whitley, K. T., Husar, R. B., and Liu, B.Y.H., "Aerosol Size Distribution of the Los Angeles Smog", J. Colloid and Interface Sci., 39, 177 (April, 1972).

## Organic Analyses of Aerosols

### Solvent Extraction of Particulate

Aerosols collected on quartz-fiber filters were subjected to Soxhlet extraction, first with methylene chloride (20 hours) and then with dioxane (44 hours). Throughout, only high-purity* solvents were used, and dioxane was redistilled before use. For each sampling day, three quartz filters ($Q_1$, $Q_2$, and $Q_3$) were combined. That is, samples simultaneously collected using the two Andersen samplers and the cyclone-equipped sampler were combined for extraction. Approximately 100 ml of each solvent was used per set of filters. The volume of each methylene chloride extract was reduced to approximately 1 ml by vacuum distillation (10 in Hg at 35 C pot temperature) using a Kuderna-Danish fractionating column. The weight of methylene chloride extractables was determined by taking an aliquot of the concentrate (~5 percent) and evaporating the solvent on a light (~5 mg) aluminum weighing pan. Pans were tared and reweighed using a Cahn electrobalance, and aliquot weights were determined to ±2 μg. From these data, the total weight of the methylene chloride extractable material was calculated. Use of this procedure obviated the necessity for taking the entire sample to dryness. This is desirable in that the methylene chloride extract can be expected to contain the more volatile (nonpolar) sample components. Taking the entire sample to dryness might compromise the sample with respect to such components. The dioxane extracts, containing the more polar, less volatile components, were reduced by lyophilization (freeze drying). Solvent and filter blanks were carried through the reflux and concentration procedures. In calculating the weight percent solvent extractable, values due to such solvent and filter background were subtracted. Data concerning blanks are presented in the Results and Discussion section. Values for weight percent methylene chloride extractable and weight percent dioxane extractable were calculated as follows:

$$\text{Weight percent solvent extractable} = \frac{\text{(Weight of extracted matter, corrected)}}{\text{(Weight of total particulate)}} \times 100 \ .$$

In order to demonstrate that the dioxane does not extract significant quantities of inorganic salt from the filters, 100-ml portions of dioxane were stirred with ammonium sulfate, ammonium nitrate, lead nitrate, sodium carbonate, and sodium chloride. The suspensions were filtered and the dioxane filtrates were lyophilized in tared flasks. Salt residues were only barely visible, and did not exceed 0.3 mg.

### Determination of Weight Percent CHN

Determinations of weight percent C, H, and N were conducted using a Perkin-Elmer Model 240 elemental analyzer with gas purification accessory. The instrument performs automated Pregel-Dumas determinations. Values shown for weight percent oxygen [O] were calculated by difference from the CHN data. Approximately 1 mg of sample was used for each determination.

### Infrared Spectroscopy

Infrared spectra were obtained using a Perkin-Elmer Model 521 grating infrared spectrophotometer. Spectra were obtained of thin films of sample on a sodium chloride plate.

---

*"Distilled in-glass" solvents obtained from Burdick and Jackson, Muskegon, Michigan.

Reduction of spectroscopic results to numerical form was performed by calculating relative peak intensities for specified absorptions. Values of relative peak intensity were obtained by calculating the ratio of the optical density for the specified absorption to that observed for the CH stretching vibration at 2920 $\text{cm}^{-1}$; i.e.,

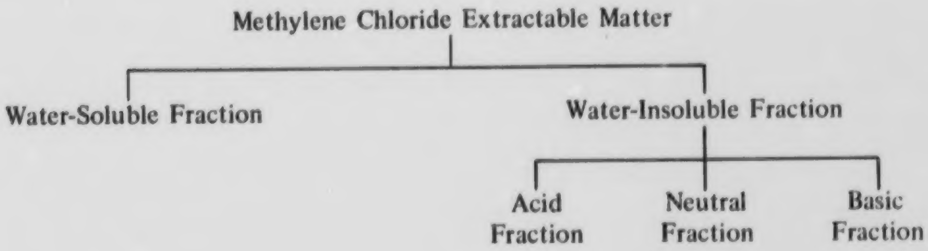
$$\text{Relative intensity} = \frac{(\text{O.D.} - \text{specified absorption})}{(\text{O.D.} - 2920\ \text{cm}^{-1})} .$$

### Nuclear Magnetic Resonance Spectroscopy

Nuclear magnetic resonance (NMR) spectroscopy was performed using a modified Varian Associates 60 MHz spectrometer. The instrument is equipped to perform Fourier-transform (FT) spectroscopy. Instrument control, data acquisition, and reduction in the Fourier-transform mode are accomplished using a Digilab digital computer interfaced with the spectrometer. Fourier-transform spectroscopy permits the rapid generation of spectra, consequently allowing the generation of a large number of spectra in a relatively short period of time. Computer time averaging a series of such spectra leads to enhanced signal-to-noise ratio and permits acquisition of useful spectra not obtainable by conventional techniques. The current application required the use of FT-NMR to obtain adequate spectra. Spectra were obtained using ~1-mg samples of extractable matter. Methylene chloride extractables were analyzed in deutero-chloroform solution and dioxane extractables were analyzed in deutero-dioxane solution. From the spectra obtained, aromatic/aliphatic ratios were obtained. These values are expressed as *proton-percent aromatic*, and were calculated on the basis of the integrated resonances for methyl and methylene protons and the integrated resonances for aromatic protons.

### Sample Fractionation

The methylene chloride extractable matter was fractionated as noted in the scheme shown below. The material was fractionated first into water-soluble and water-insoluble components by partitioning the methylene chloride solution against distilled water. All extractions were conducted in conical centrifuge tubes agitated by means of a Vortex-Genie mechanical mixer. This procedure permits convenient centrifugation of emulsions prior to separation of phases, and minimizes sample losses. Water was removed by lyophilization, and the weight of the water-soluble fraction was determined.



The water-insoluble material remaining in methylene chloride solution was next fractionated into acid, basic, and neutral components. The solution was extracted using first 2N aqueous sodium hydroxide and then 2N hydrochloric acid. Material remaining in methylene chloride solution after extractions with both aqueous sodium hydroxide and hydrochloric acid is defined as the water-insoluble neutral fraction.

The sodium hydroxide extract (containing organic-acid salts) was brought to pH ~0.8, and the free acid was extracted into methylene chloride using a continuous liquid/liquid extractor. Similarly, the hydrochloric acid extract (containing organic-base salts) was brought to pH ~13, and the free base was extracted into methylene chloride, again using a continuous liquid/liquid extractor. The methylene chloride solutions containing the acid, basic, and neutral fractions were dried by refluxing the solutions over a 3 A molecular sieve. Drying the solutions directly with anhydrous magnesium sulfate or molecular sieve was found to be unsatisfactory because of irreversible adsorption of organics upon the drying agent.

The dried solutions were concentrated to a volume of ~1 ml using a Kuderna-Danish fractionating column. The weight of organic matter in the concentrated solutions was determined by taking an aliquot of the concentrate (~5 percent) and evaporating the solvent on a light (~5 mg) aluminum weighing pan. Pans were tared and reweighed using a Cahn electrobalance, and aliquot weights were determined to ±2 μg. Using values determined for the weights of the various fractions, weight percent values were calculated.

## Functional-Group Analyses

Quantitative functional-group analyses for alcohol and for carbonyl were performed using the water-insoluble neutral fraction of the methylene chloride extractable matter. Isolation of this fraction was described above. Procedures for determining micromolar quantities of carbonyl have been described in the literature.(5) The procedure selected for use in this program(6) is based upon the colorimetric determination of 2,4-dinitrophenylhydrazones, and is described below. In contrast, micro-functional-group analysis for alcohols has not been reported. Thus, during this report period, an existing macroscale procedure(7,8) was adapted to the microchemical requirements of this application. Details of the method are presented below.

The procedure for determination of alcohols is subject to interference from carboxylic acids, phenols, and amines. Thus, the analysis is conducted on the neutral fraction. Although the carbonyl determination is not subject to the interferences that limit the alcohol analysis, the carbonyl determination is applied to the neutral fraction in order that a comparison can be made between alcohol and carbonyl content in the same sample fraction.

**Determination of Alcohol.** The method selected for adaptation is based on the reaction of lithium aluminum hydride with the hydroxyl group. Although amines, carboxylic acids, and phenols also react, these compounds are not present in the neutral fraction, and hence do not interfere. It is expected that a modified version of the procedure could be adapted to determine hydroxy acids in the acid fraction. This would involve treatment of the acid fraction with diazomethane to yield methyl esters and methyl-aryl ethers of the carboxylic acids and phenols, respectively. By performing duplicate analyses before and after diazomethane treatment, values could be calculated for both total acid-associated alcohol and total acid hydrogen.

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(5) Siggia, S., *Quantitative Organic Analysis*, John Wiley (1963).

(6) Lappin, G. R., and Clark, L. C., Anal. Chem., **23**, 541 (1951).

(7) Weiss, F. T., *Determination of Organic Compounds: Methods and Procedures*, Wiley-Interscience (1970), p 124.

(8) Gaylord, N. G., *Reduction With Complex Metal Hydrides*, Interscience (1956).

Procedures utilizing the lithium aluminum hydride reaction for large-scale alcohol determinations are well documented, and involve the collection of evolved hydrogen in a gas burette.(7,8) In the procedure modified for this microchemical application, the sample is treated with hydride in a micro reaction vessel (~200 μl) which is plumbed directly to the inlet of a gas chromatograph. The evolved hydrogen is swept onto a 1 ft x 2 mm alumina column, and is quantitated using a thermal conductivity detector. As presently employed, the method has been demonstrated to be reproducible over the range $10^{-8}$ to $10^{-5}$ mole of alcohol, and linear calibrations were obtained over this range. The sensitivity of the method is well within that required for this application. For example, a 1-mg sample containing $1 \times 10^{-8}$ mole of alcohol corresponds to a concentration of 0.016 weight percent alcoholic oxygen.

**Determination for Carbonyl.** Of the methods available for the quantitative determination of carbonyl, the colorimetric method involving the formation of 2,4-dinitrophenylhydrazone is most suitable for the current application.(5,6) The colored derivative formed is stable for several hours. Further, the molar absorbances of hydrazones formed from different carbonyl compounds varies so little that the method is well suited to the determination of "total carbonyl". The method is most useful in the range of carbonyl concentration from $10^{-4}$ to $10^{-6}$ M. This is well within the sensitivity range required for the current application. For example, if a 1-mg sample containing $1 \times 10^{-8}$ mole of carbonyl is dissolved in 1 ml of solvent for analysis, the solution is $1 \times 10^{-5}$ M. in carbonyl. Such a sample contains 0.016 weight percent carbonyl oxygen.

Calibrations were carried out using $5 \times 10^{-2}$ molar solutions of n-heptaldehyde and 2-heptanone; 1 to 25 μl of these solutions were added to 1 ml of carbonyl-free methyl alcohol. A linear calibration over the range $10^{-7}$ to $10^{-6}$ mole of carbonyl against optical density was obtained.

## SAMPLING SITES

### Columbus, Ohio

The geographic features of the Columbus region range from the Ohio till plain and central lowland to the Appalachian Plateau. The hills on the eastern and southeastern edge of this region are generally <200 feet high. Climatology is typically Midwest and is classified as humid continental, long summer phase. The City of Columbus, along with the heavier manufacturing area of the town, is located in a dish-shaped basin in comparison with the rest of the countryside. The result of this feature is a slightly more stable air mass and more persistent morning inversions. The mean wind speeds are the second lowest in the state for major cities, and the wind direction is primarily south to southwest.

The mobile air-quality laboratory was located in an open area at an abandoned Army Post, Fort Hayes, just northeast of the downtown area. The site was ideally situated for sampling aged downtown air masses, without the influence of any point-source emissions.

### Welfare Island – New York City

Climatology in the New York region is changeable, with variable wind speed and direction. The laboratory was located on the northern tip of Welfare Island in the East River (saltwater).

The Island is situated between Manhattan, about 200 yards to the West, and Queens, about 200 yards to the East. The sampling site was parallel with Central Park in Manhattan. There was very little activity on the island, and the air sampled was representative of well-mixed, aged, and diluted air masses which flow back and forth among the Boroughs, and from New Jersey to the West.

### Pomona, California

Aerosol collections in California were performed at the Los Angeles County Fairground in Pomona, California. The town of Pomona lies approximately 45 miles due east of downtown Los Angeles, 30 miles west of San Bernardino, 5 to 10 miles south of the San Gabriel Mountains and about 5 miles north of the Puente Hills. With the mountains to the north and the hills to the south, the site is in a long valley which opens into the L.A. basin to the west. The area within 5 miles to the west is mostly undeveloped and consists of recreational areas, small airfields, and some small colleges. The closest industry is 10 to 15 miles to the southwest in the City of Industry.

## RESULTS AND DISCUSSION

### Air Quality

Air-quality data from each of the three sampling sites are summarized in Tables 2 through 4. More comprehensive air-quality data appear in Appendix A. Diurnal profiles of the data are displayed there, together with meteorological conditions and tabulations of 24-hour averages and hourly maximums of gas-phase pollutants (CO, NO, $NO_2$, $SO_2$, $O_3$, THC, $CH_4$, $C_2H_2$, and $C_2H_4$) and light scattering.

Referring to the aerosol mass loading data in Tables 2 through 4, the mass concentration of aerosols $<2\ \mu m$ in diameter should be comparable for quartz and Millipore filters. Other than experimental error, there is no apparent reason for the differences in the mass data obtained on the two media. In those tables, the data headed by Millipore-B/A represent the fraction of the total aerosol mass which was in the $<2\ \mu m$ size range on a given day.

The significance of separating the aerosols according to size will become apparent when comparing the chemical composition of the two size fractions. Statistical analyses of the mass loading data indicate that $2\ \mu m$ is a satisfactory cutoff size for particles significantly influencing atmospheric visibility due to light scattering. In Columbus and New York where integrated light scattering was determined, the linear correlation coefficient between scattering and mass concentration of aerosols $<2\ \mu m$ in diameter was 0.94. On the other hand, the correlation of scattering with total mass concentration (all sizes) was only 0.59.

TABLE 2. SUMMARY OF AIR QUALITY – COLUMBUS – JULY, 1972

| | | Weather Conditions | | | Aerosol Mass Loading, $\mu g/m^3$ | | | | Light | Pollutants | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Quartz, | Millipore | | | Scattering, | 24-Hr Avg | | 1-Hr Max | |
| Date[(a)] | Day | General[(b)] | Temp, C | RH, % | $<2\ \mu m$ | A-Total | $B<2\ \mu m$ | B/A | $10^{-4}\ m^{-1}$ | THC, ppm | $SO_2$, ppm | $NO_2$, ppm | $O_3$, ppm |
| 7-19 | W | PC | 27 | 71 | – | – | – | – | 5.2 | 3.3 | 0.018 | 0.137 | 0.083 |
| 7-20$^+$ | Th | S | 29 | 65 | 90 | – | – | – | 7.3 | 3.4 | 0.018 | 0.107 | 0.143 |
| 7-21$^\pm$ | F | S | 30 | 64 | 69.5 | 85.9 | 72.9 | 0.85 | 5.8 | 3.4 | 0.020 | 0.148 | 0.117 |
| 7-22$^+$ | Sa | S | 29 | 67 | 66.3 | 126.5 | 89.2 | 0.70 | 5.6 | 3.5 | 0.027 | 0.204 | 0.079 |
| 7-23 | Su | PC | 29 | 62 | 48.2 | 56.2 | 40 | 0.71 | 3.3 | 3.1 | 0.023 | 0.067 | 0.089 |
| 7-24 | M | PC | 26 | 68 | 42.4 | – | – | – | 1.3 | 2.9 | 0.018 | – | 0.095 |
| 7-26$^\pm$ | W | S | 22 | – | 34.6 | 60 | 36.5 | 0.61 | 1.6 | 2.9 | 0.020 | – | 0.087 |
| 7-27 | Th | C | 22 | – | 49.7 | – | – | – | 4.7 | 2.7 | 0.014 | – | 0.099 |
| 7-28$^+$ | F | PC | 20 | – | 45.4 | 81 | 59 | 0.73 | 2.5 | 2.5 | 0.034 | – | 0.064 |
| 7-29 | Sa | PC | 19 | – | 32.6 | 49.4 | 34.1 | 0.69 | 2.1 | 2.7 | 0.031 | – | 0.050 |

(a) + denotes days for which inorganic aerosol data are available.
± denotes days for which both organic and inorganic aerosol data are available.

(b) Sunny (S), partly cloudy (PC), cloudy (C), rain (R).

### TABLE 3. SUMMARY OF AIR QUALITY – NEW YORK – AUGUST, 1972

| | | Weather Conditions | | | Aerosol Mass Loading, $\mu g/m^3$ | | | | Light | Pollutants | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Quartz, | Millipore | | | Scattering, | 24-Hr Avg | | 1-Hr Max | |
| Date[a] | Day | General[b] | Temp, C | RH, % | <2 µm | A-Total | B<2 µm | B/A | $10^{-4}$ $m^{-1}$ | THC, ppm | $SO_2$, ppm | $NO_2$, ppm | $O_3$, ppm |
| 8-7 | M | S | 25 | 69 | – | – | – | – | 2.6 | 3.3 | 0.021 | – | 0.082 |
| 8-10 | Th | PC | 19 | 48 | – | – | – | – | 0.9 | 3.7 | 0.019 | 0.026 | 0.037 |
| 8-11‡ | F | PC | 21 | 55 | 34.3 | 81.1 | 23.8 | 0.29 | 1.4 | 3.5 | 0.022 | 0.033 | 0.117 |
| 8-12 | Sa | C | 22 | 69 | 45.4 | 106.0 | 37.8 | 0.35 | 2.2 | 3.4 | 0.021 | 0.033 | 0.078 |
| 8-13+ | Su | C | 25 | 67 | 60.9 | 180.0 | 91.9 | 0.51 | 4.2 | 3.8 | 0.026 | 0.050 | 0.158 |
| 8-14+ | M | PC | 28 | 69 | 37.4 | 173.0 | 45.5 | 0.26 | 3.0 | 3.7 | 0.020 | 0.059 | 0.175 |
| 8-16 | W | S | 20 | 47 | 26.6 | 57.3 | 18.3 | 0.32 | 1.2 | 3.9 | 0.019 | 0.052 | 0.057 |
| 8-17 | Th | S | 20 | 70 | 20.8 | 69.1 | 41.0 | 0.59 | 1.1 | 3.6 | 0.014 | 0.025 | 0.042 |
| 8-18+ | F | C | 23 | 70 | 55.6 | 209.0 | 58.6 | 0.28 | 4.3 | 4.5 | 0.031 | 0.079 | 0.076 |
| 8-19 | Sa | S | 24 | 56 | – | – | – | – | 1.4 | 3.8 | 0.022 | 0.035 | 0.087 |
| 8-20 | Su | S | 23 | 56 | – | – | – | – | 1.4 | 3.9 | 0.019 | 0.042 | 0.119 |
| 8-21 | M | S | 22 | 60 | 34.7 | 112.0 | 48.6 | 0.43 | 1.8 | 4.7 | 0.028 | 0.072 | 0.095 |
| 8-22+ | Tu | S | 23 | 65 | 43.2 | 108.0 | 43.0 | 0.40 | 2.7 | 4.7 | 0.008 | 0.090 | 0.164 |
| 8-23‡ | W | PC | 25 | 74 | 53.4 | 179.0 | 71.9 | 0.40 | 3.5 | 5.0 | 0.020 | 0.144 | 0.094 |
| 8-24+ | Th | PC | 27 | 70 | 69.8 | 182.0 | 68.6 | 0.37 | 4.7 | 5.0 | 0.009 | 0.093 | 0.156 |
| 8-25+ | F | PC | 28 | 70 | 74.6 | 161.0 | 79.1 | 0.49 | 5.0 | 5.7 | 0.013 | 0.147 | 0.225 |

TABLE 3. (Continued)

| | | Weather Conditions | | | Aerosol Mass Loading, $\mu g/m^3$ | | | | Light Scattering, $10^{-4}$ $m^{-1}$ | Pollutants | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Quartz, | Millipore | | | | 24-Hr Avg | | 1-Hr Max | |
| Date(a) | Day | General(b) | Temp, C | RH, % | <2 $\mu m$ | A-Total | B<2 $\mu m$ | B/A | | THC, ppm | $SO_2$, ppm | $NO_2$, ppm | $O_3$, ppm |
| 8-26 + | Sa | PC | 25 | 76 | 63.4 | 169.0 | 81.0 | 0.48 | 4.4 | 5.6 | 0.012 | 0.112 | 0.159 |
| 8-27 | Su | PC | 26 | 70 | 34.3 | 99.0 | 41.0 | 0.41 | 2.4 | 4.3 | 0.019 | 0.045 | 0.151 |
| 8-28 | M | S | 25 | 61 | 41.5 | 88.1 | 23.7 | 0.27 | 2.7 | 4.6 | 0.025 | 0.038 | 0.075 |
| 8-29 + | Tu | S | 25 | 58 | 49.3 | 104.3 | 35.6 | 0.34 | 2.9 | 4.5 | 0.025 | 0.044 | 0.112 |
| 8-30 + | W | S | 24 | 61 | 43.0 | 93.5 | 40.0 | 0.43 | 2.1 | 4.4 | 0.025 | 0.029 | 0.104 |

(a) + Days for which inorganic analyses are available.
‡ Days for which organic and inorganic analyses are available.
(b) Sunny (S), partly cloudy (PC), cloudy (C), rain (R).

TABLE 4. SUMMARY OF AIR QUALITY – POMONA – NOVEMBER, 1972

| | | Weather Conditions | | | Aerosol Mass Loading, $\mu g/m^3$ | | | | | Pollutants(d) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Quartz, | Millipore | | | | 24-Hr Avg | | 1-Hr Max | |
| Date(a) | Day | General(b) | Temp, C | RH, % | <2 μm | A-Total | B<2 μm | B/A | Visibility(c), miles | THC, ppm | $SO_2$, ppm | $NO_2$, ppm | $O_3$, ppm |
| 11-10 ‡ | F | S | – | – | 19.7 | 48.9 | 13.2 | 0.27 | 9.9 | 3.0 | 0.013 | 0.14 | 0.03 |
| 11-11 ‡ | Sa | S | – | – | 12.0 | 32.4 | 6.7 | 0.21 | 25.8 | 2.3 | 0.01 | 0.06 | 0.03 |
| 11-12 ‡ | Su | S | – | – | 19.4 | 43.6 | 17.3 | 0.40 | 24.0 | 2.6 | 0.01 | 0.06 | 0.02 |
| 11-13 ‡ | M | S | – | – | 19.2 | 46.0 | 15.3 | 0.33 | 18.3 | 3.0 | 0.012 | 0.07 | 0.03 |
| 11-14 | Tu | R | – | – | – | – | – | – | 7.2 | 2.9 | 0.01 | 0.06 | 0.02 |
| 11-15 | W | S | – | – | 14.8 | 40.0 | 13.2 | 0.33 | 12.9 | 2.9 | 0.01 | 0.06 | 0.02 |
| 11-16 | Th | R | – | – | – | – | – | – | 14.3 | 2.3 | 0.01 | 0.06 | 0.01 |
| 11-17 | F | S | – | – | 17.1 | 43.1 | 13.8 | 0.32 | 26.8 | 2.5 | 0.014 | 0.05 | 0.03 |
| 11-18 ‡ | Sa | PC | – | – | 52.4 | 114.2 | 55.0 | 0.48 | 8.9 | 3.2 | 0.015 | 0.10 | 0.04 |
| 11-19 + | Su | PC | – | – | 68.9 | 141.3 | 60.6 | 0.43 | 2.4 | 3.3 | 0.014 | 0.11 | 0.05 |

(a) + Days for which inorganic analyses are available.
‡ Days for which organic and inorganic analyses are available.
(b) Sunny (S), partly cloudy (PC), cloudy (C), rain (R).
(c) Data supplied by Brackett Field Airport, La Verne, California.
(d) Data supplied by the County of Los Angeles Air Pollution Control District.

The air-quality data obtained in Columbus and Pomona are too limited to permit making generalizations about the average or typical air quality of these localities. In New York, however, it appears that a large enough data base was obtained to permit an assessment of air quality there during a sustained period of good ventilation.

Figures 3A and 3B profile the average diurnal air quality existing during the 1-month sampling period on Welfare Island. Referring to Figure 3A, at about 7 a.m. there is a pronounced increase in NO followed by the typical photochemical transformation to $NO_2$. The buildup of $NO_2$ in the evening results from the reaction of newly emitted NO with the $O_3$ that accumulated during the day. The average level of ozone provides further evidence of the formation of photochemical smog in the area. Ozone exceeded the 1-hour maximum standard (0.08 ppm) on 15 of the 21 sampling days.

In spite of the apparent photochemical activity, light scattering was generally quite low (average $b_{scat}$ ~3 x $10^{-4}$ $m^{-1}$ corresponding to visibility distance of ~10 miles). Also surprising is the absence of a noontime or afternoon peak in light scattering typical of pronounced photochemical aerosol formation. During the daylight hours, the maximum in light scattering occurred during the morning rush hours (7 to 9 a.m.). During the evening, light scattering appears to be strongly influenced by humidity, as indicated in Figure 3A.

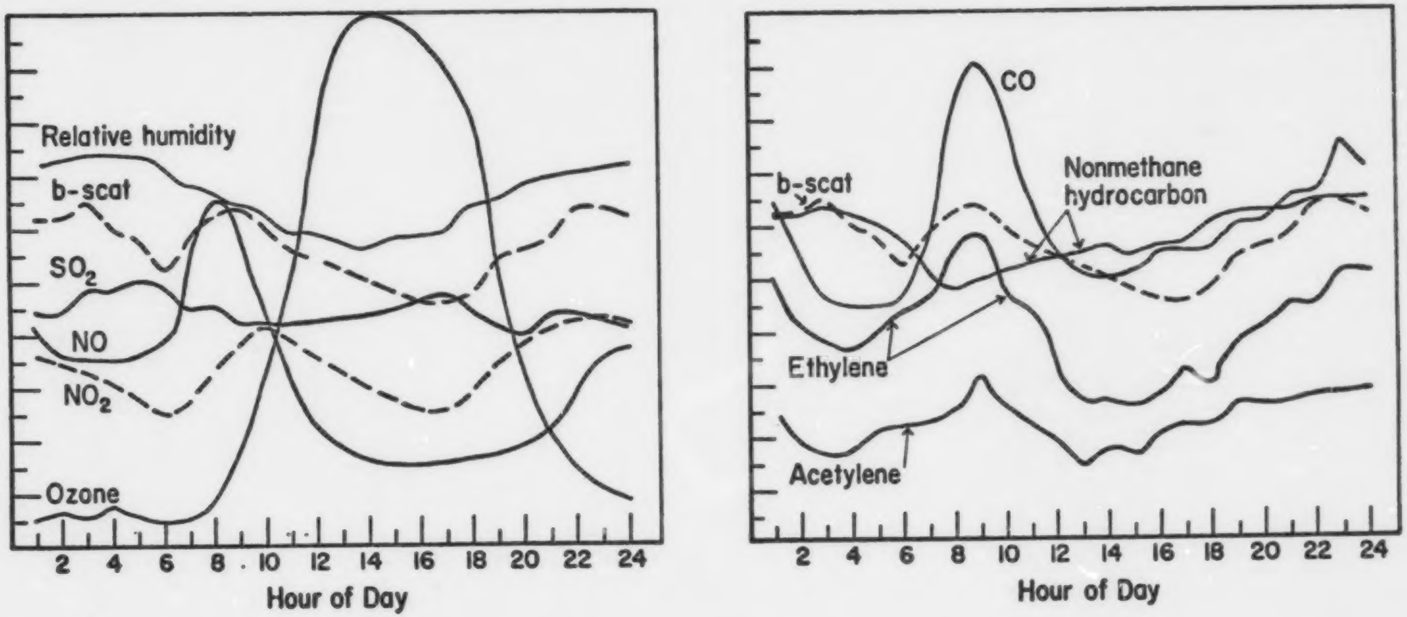
The profiles in Figures 3A and 3B show another interesting result; the nonmethane hydrocarbon (NMHC) curve is not significantly influenced by obvious trends in motor-vehicle activity, although other automotive emissions (CO, NO, $C_2H_2$, and $C_2H_4$) correspond to such trends. It is conceivable that the NMHC profiles reflect inputs from stationary combustion sources and/or from New Jersey refining operations. This is a controversial finding, however, and requires further clarification.

An assessment of the vehicle-exhaust contribution to NMHC can be made by examining changes in vehicle-related emissions during the period of greatest increase in automotive activity: from 7 to 9 in the morning. According to data in Figures 3A and 3B, the following average increases in concentrations were determined during those 2 hours.

| | PPM |
|---|---|
| CO | 0.64 |
| NO | 0.022 |
| $C_2H_2$ | 0.0020 |
| $C_2H_4$ | 0.0025 |

The magnitude of these increases, together with approximations of vehicle-exhaust composition, can be used to predict the increase in NMHC during the period in question. Assume the following exhaust-emission composition relative to nonmethane hydrocarbon:

| | |
|---|---|
| CO/NMHC | 13 |
| NO/NMHC | 0.4 |
| $C_2H_2$/NMHC | 0.06 |
| $C_2H_4$/NMHC | 0.12 |



A

B

FIGURE 3. AVERAGE AIR QUALITY FOR MONTH OF AUGUST, 1972; WELFARE ISLAND, NEW YORK

Full-scale ordinate values for the curves are: b-scat ($5 \times 10^{-4}$ m$^{-1}$), relative humidity (100 percent), SO$_2$ (0.05 ppm), NO (0.10 ppm), NO$_2$ (0.10 ppm), ozone (0.10 ppm), nonmethane hydrocarbon (5.0 ppm), CO (2.0 ppm), ethylene (0.020 ppm) and acetylene (0.020 ppm).

Applying these ratios to the respective changes in emission levels noted above yields the following predictions of 2-hour increases in hydrocarbons due to automotive exhaust:

| Predictor | Predicted Increase in NMHC, ppm C |
|---|---|
| CO | 0.049 |
| NO | 0.055 |
| $C_2H_2$ | 0.033 |
| $C_2H_4$ | 0.021 |

These predicted hydrocarbon concentrations are virtually insignificant compared with the total NMHC level (2.5 to 3.0 ppm C), and are consistent with the absence of a maximum in the actual NMHC curve during the morning rush hours. Even if the assumptions in exhaust composition made in this exercise are in error by a ridiculous factor of 5, the automotive exhaust contribution to NMHC would be <10 percent.

### Inorganic Composition of Aerosols

Detailed inorganic compositions of selected aerosol samples appear in Appendix B. Elemental analyses of aerosols collected on Millipore filters are presented in Table B-1. Analyses for total C, H, N, S, $SO_4^=$, $NO_3^-$, $NH_4^+$, $Cl^-$, $Br^-$, and Pb on quartz filters are presented in Table B-2. Compositions of aerosols by element categories are summarized in terms of weight percent in Table B-3.

Similarities and/or differences in composition of aerosols between sampling sites and between aerosol size fractions (< 2 μm >) are apparent from the summary data in Table 5. The compositions of aerosols <2 μm diameter presented are the averages of samples from 5 days in Columbus, 11 days in New York, and 6 days in Pomona. Data for aerosols >2 μm are averages from 11 days in Columbus and 27 days in New York; no large aerosols were collected in Pomona.

As indicated in Table 5, nearly all the metallic compounds are associated with large particles; of all the metals, only lead and zinc were found to predominate in the small aerosol size range. Nearly all of the carbon of the large particles is inorganic (presumably carbonate), as borne out by the small amount of hydrogen in that size range. In New York, chlorine was the predominant halogen – its concentration is attributed primarily to sea salt. In each city, sulfate was a major contributor to the mass of small particles. Although not indicated in Table 5, there was a considerable amount of nonsulfate sulfur in the small particles.

Nitrate was found in both particle size ranges; the significant finding for nitrate is the order-of-magnitude greater concentration in the Pomona aerosols compared with that in Columbus and New York aerosols. Ammonium was found almost exclusively in the small particle size range.

In total, the categories included in Table 5 account for 50 to 80 percent of the total aerosol mass determined at the time of collection. Other components, particularly water, oxygen, and nonsulfate sulfur are thought to account for the remaining fractions.

### TABLE 5. AVERAGE AEROSOL CONSTITUENTS AT THREE LOCALITIES

| | Weight Percent According to Aerosol Size | | | | | |
|---|---|---|---|---|---|---|
| | Columbus | | New York | | Pomona | |
| Aerosol diameter ($\mu$m): | <2 | >2 | <2 | >2 | <2 | >2 |
| **Constituent** | | | | | | |
| Metals | 1 | 36 | 2 | 37 | 2 | NC[(a)] |
| Carbon | 17 | 17 | 26 | 16 | 25 | " |
| Hydrogen | 6 | 1 | 6 | 1 | 5 | " |
| Halogen | 0 | 1 | 1 | 6 | 2 | " |
| Sulfate | 19 | 2 | 22 | 4 | 14 | " |
| Nitrate | 1 | 2 | 4 | 3 | 24 | " |
| Ammonium | 6 | 0 | 7 | 0 | 9 | " |
| Total | 50 | 59 | 68 | 69 | 81 | " |

(a) NC: large aerosols not collected.

## Organic Composition of Aerosols

The organic analyses adapted for use in this study provide information concerning the broad chemical classes and functional groups present in the organic fraction of air particulate. Two major factors determined the nature of the analyses undertaken:

(1) The statistical treatment of the results ultimately required

(2) The limited quantities of sample available for analysis.

Since the results are to be treated statistically, the analyses must be quantitative or semiquantitative. This application requires numerical data points for the organic composition comparable to those more commonly obtained for the gas phase, and for the inorganic components of particulate. Further, the number of discrete samples analyzed must be large enough to permit statistical treatment of the results. This puts a practical limitation on the time and cost that may be expended analyzing each day's sample. Detailed fractionation and analysis can be expected to provide needed insight into the nature and origin of haze formation. Such analysis, however, is best applied to carefully selected samples. The basis for such selection can be developed using a broad-scale analytical scheme applied to a large number of daily samples. The scheme developed and applied during this report period fulfills, in part, this need for broad-scale characterization leading to numerically expressible results.

Diurnal sampling limited the quantities of sample available for analysis. Although three simultaneously operating 20-cfm sampling systems were used, the organic material extracted from the $<2\ \mu m$ aerosols averaged about 14 mg per extraction. Within these limitations, both spectroscopic and wet-chemical analyses were conducted. In considering the results of the analytical studies it should be pointed out that the number of data points available at this time is too small to permit firm interpretation. The results presented should serve, however, to illustrate the types of numerical data that can be developed for the organic composition, and the types of questions that a more complete data set of this type might serve to answer. The results are presented under the following headings:

- Solvent-Extractable Particulate Matter
- Weight Percent C, H, and N
- Infrared Spectra
- Aromatic/Aliphatic Ratio
- Acid/Base/Neutral Distribution
- Functional Group Concentrations.

Recall that six aerosol samples were analyzed: two each from New York City, Pomona, California, and Columbus, Ohio. Five of the six samples were discrete daily samples. The sixth, a Pomona sample, was a composite of particulate pooled from three similar days. For each of the three sites, one sample was collected during a period of relatively high mass loading and the other during a period of relatively low mass loading. The atmospheric data for these sampling days are summarized in Tables 2 through 4.

## Solvent-Extractable Particulate Matter

Sequential Soxhlet extraction using methylene chloride followed by dioxane was used in order to obtain a wider range of organics than are extractable using the more commonly applied single-solvent procedure. Dioxane can be expected to dissolve the polar, relatively oxidized organics normally left behind by benzene or chlorinated solvents. The data shown in Table 6 indicate that the dioxane extractables do indeed represent a significant fraction of the total extractable organic matter.

As noted in the Experimental Methods section of this report, an experiment was conducted to verify that dioxane does not extract significant quantities of inorganic salt from the filters. Several salts were stirred individually with dioxane, and the filtered solvent was lyophilized in tared flasks. The data indicate that such inorganic salts do not correspond to more than 4 percent of the dioxane extractable matter, and that most likely this value is less than 1 percent of the dioxane-extractable matter.

Throughout the course of the determinations, solvent and filter blanks were carried through the reflux and concentration procedure. In calculating the values shown in Table 6, blanks due to solvent and filter background have been subtracted. Typically, three 6-inch-diameter quartz-fiber filters were extracted using 100 ml of solvent. Blanks were determined as 0.09 mg (±0.01 mg) per disk for methylene chloride extractions, and 0.8 mg (±0.3 mg) per disk for dioxane extractions. The magnitude and variability of the dioxane blank is such that data concerning the dioxane-extractable matter should be interpreted cautiously. Nevertheless, it is felt that these values are not entirely spurious, and that they demonstrate that a significant fraction of atmospheric particulate matter consists of relatively oxidized organic matter. This assertion is supported by data for weight percent C, H, and N determined for methylene chloride and dioxane-extractable matter. Although these data are considered more fully in the section below (Table 7), values for weight percent N in the dioxane-extractable matter roughly parallel those observed for the methylene chloride-extractable matter. Moreover, CHN analysis of a dioxane-blank residue reveals only trace N, 44.1 weight percent C, 6.4 weight percent H, and 0.1 weight percent N. Thus, although there is some doubt as to the precision and reliability of values for weight percent dioxane-extractable matter, these data are included in the hope that they may be helpful within the specified limitations.

Considering the data in Table 6 more closely, there appears to be an interesting trend within the three pairs of days. Notice that for each pair of days, the day with the higher mass loading has the lower value for weight percent methylene chloride extractable. For two of the three sites (New York and Pomona), as the weight percent methylene chloride extractable decreases, the weight percent dioxane extractable increases. A statistically significant trend of this type would suggest that on days of high mass loading, the organic constituents of particulate are relatively oxidized in comparison with particulate for low-mass-loading days.

Data obtained from infrared spectroscopy and CHN analysis are useful in assessing the relative composition of the methylene chloride- and dioxane-extractable fractions, and they are considered below.

## Weight Percent C, H, and N

Values of weight percent C, H, N, and [O] for the methylene chloride and dioxane extractables are shown in Table 7. The values for weight percent [O] were calculated by difference from the Pregel-Dumas determination of C, H, and N. As expected, weight percent

TABLE 6. SOLVENT EXTRACTION OF PARTICULATE MATTER

| Site | Date | Mass Loading, μg/m$^3$ | Total Particulate Taken for Extraction, mg | No. of Filter Disks Extracted | Methylene Chloride Extraction | | Dioxane Extraction[(a)] | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Weight Extractable Matter, Corrected for Blank, mg | Weight Percent Extractable | Weight of Extractable Matter, Corrected for Blank, mg | Weight Percent Extractable |
| Columbus | July 21 | 69.5 | 128.6 | 2.5 | 10.58 | 8 | 10.91 | 8 |
| | July 26 | 34.6 | 63.1 | 2.5 | 10.15 | 16 | 17.45 | 28 |
| New York | Aug. 23 | 53.4 | 89.0 | 2.25 | 11.50 | 13 | 20.07 | 23 |
| | Aug. 11 | 34.3 | 55.6 | 2.25 | 9.17 | 16 | 5.38 | 10 |
| Pomona | Nov. 18 | 52.4 | 60.0 | 1.5 | 9.52 | 16 | 24.03 | 40 |
| | Nov. 10-13 | 17.5 | 82.0 | 1.5 | 17.65 | 22 | 13.24 | 16 |

(a) See text.

[O] is significantly higher for the dioxane extractables than for the methylene chloride extractables. Overall, the incorporation of oxygen could be a useful indicator of the tendency of a given atmosphere to oxidize gas-phase or suspended organics. In the statistical tasks planned for the third-year study, correlation of this parameter will be investigated with various elements of the gas-phase data.

The data for weight percent C, H, N, and [O] correlate well with results of the infrared spectroscopic analysis. These results are considered in the following section.

TABLE 7. WEIGHT PERCENT CARBON, HYDROGEN, NITROGEN AND OXYGEN IN SOLVENT EXTRACTABLE MATTER

| | | Methylene Chloride Extractables, weight percent | | | | Dioxane Extractables, weight percent | | | |
|---|---|---|---|---|---|---|---|---|---|
| Site | Date | C | H | N | [O] | C | H | N | [O] |
| Columbus | July 21 | 69.3 | 9.5 | 0.8 | 20.4 | 44.4 | 6.1 | 0.8 | 48.7 |
| | July 26 | 73.0 | 10.2 | 0.9 | 15.9 | 47.2 | 6.0 | 0.8 | 46.0 |
| New York | Aug. 23 | 69.1 | 9.1 | 1.1 | 20.7 | 54.4 | 4.8 | 1.6 | 39.2 |
| | Aug. 11 | 68.8 | 9.0 | 1.3 | 20.9 | 46.6 | 5.5 | 2.2 | 45.7 |
| Pomona | Nov. 18 | 61.6 | 7.7 | 1.9 | 28.8 | 39.1 | 5.0 | 1.9 | 54.0 |
| | Nov. 10-13 | 69.3 | 8.9 | 1.3 | 20.5 | 50.6 | 5.9 | 1.6 | 41.9 |

**Infrared Spectra**

Infrared spectroscopic analysis has provided both qualitative and quantitative results. Before presenting numerical data, the relative composition of various samples will be considered from the qualitative standpoint.

In the previous section, relative compositions of the methylene chloride and dioxane extractables were considered. Continuing along these lines, infrared spectra are shown in Figure 4 for methylene chloride and dioxane extractables of particulate collected in Pomona on November 18. Note that the absorbance due to C-H stretching, near 2900 $cm^{-1}$, is relatively strong for the methylene chloride extractables and relatively weak for the dioxane extractables. Absorbances near 1100 $cm^{-1}$ may be assigned to C-O stretching for a variety of compounds including ethers, lactones, and esters. This region shows significantly stronger absorption with the dioxane extractables. Both samples show strong absorptions for carbonyl compounds in the region above 1700 $cm^{-1}$. These spectra indicate that the dioxane extractables consist of the relatively oxidized aerosol constituents compared with the less oxidized methylene chloride extractables. It is clear that with dual extraction, the range of organics being obtained is wider than that obtained with the usual single-solvent extraction. This is especially significant with regard to determination of the organic/inorganic ratio. The difficulties associated with determining this ratio are well known. Data presented earlier in this report indicate that only negligible quantities of inorganic salt are

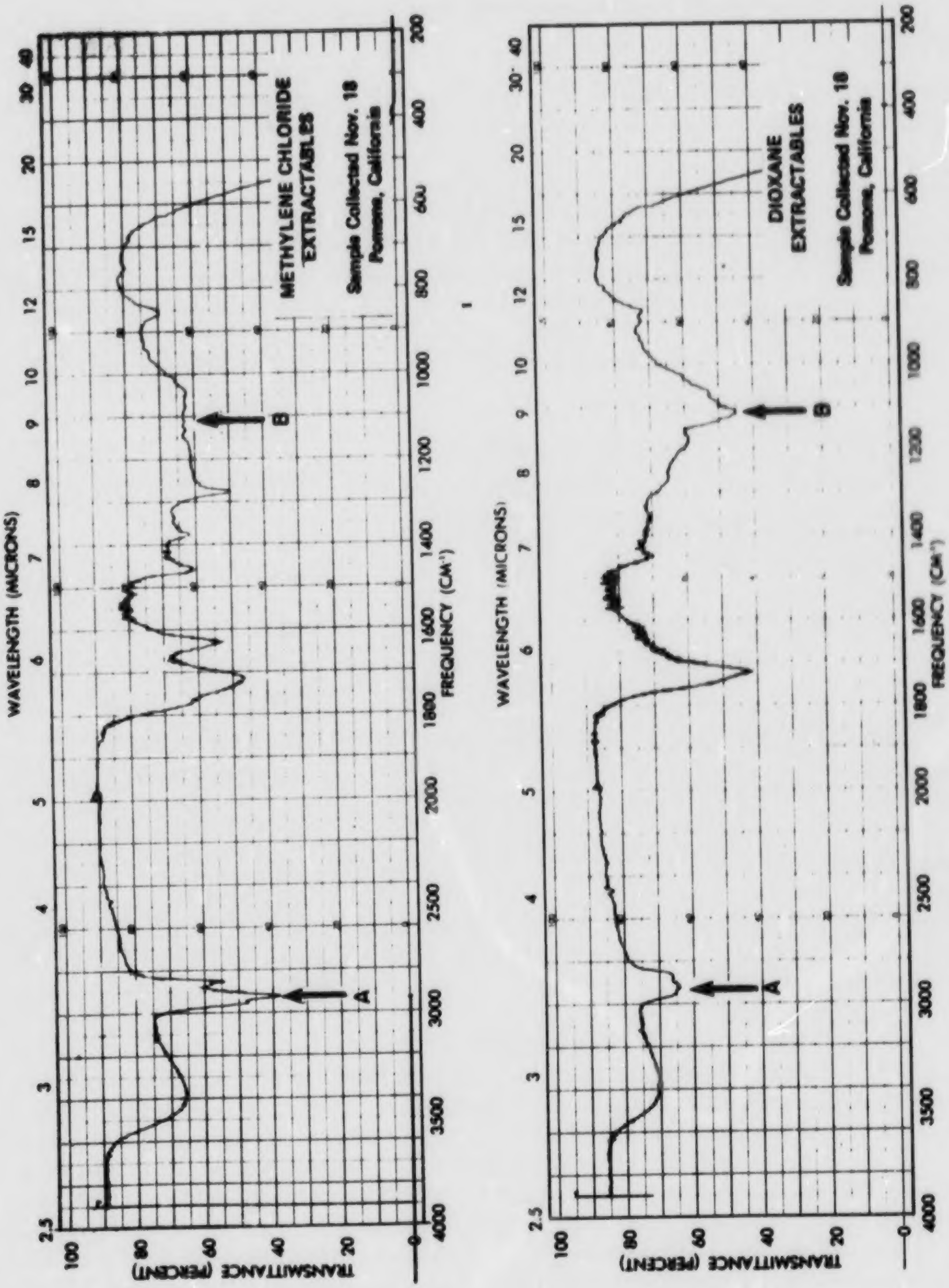
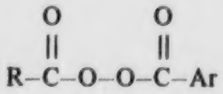


FIGURE 4. INFRARED SPECTRA OF SOLVENT-EXTRACTABLE MATTER

dissolved by dioxane. The infrared data indicate that the dioxane-extractable organics are indeed highly oxygenated, polar compounds. Thus, values for total solvent-extractable material shown in Table 6 may closely approximate values for the true percent organic in particulate matter.

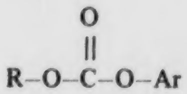
The spectra of the methylene chloride extractables suggest some apparent trends in peak position and intensity. For example, a subtle shift in the position of the carbonyl band appears to be related to the weight percent oxygen in the sample. Samples with high weight percent oxygen display a subtle shift of the carbonyl peak to slightly higher frequency. This may be seen in the spectra shown in Figure 5 (carbonyl peaks are noted with Marker B). This effect is consistent with a greater population of diketones, keto acids, and keto aldehydes in the samples having higher oxygen incorporation. As shown in Table 7, the November 18 sample has 28.8 weight percent oxygen, while the November 10-13 sample has 20.5 weight percent oxygen. The complete set of infrared spectra is included in Appendix C.

A second interesting effect concerns a shoulder near 1770 $\mathrm{cm^{-1}}$ (Marker A). The intensity of this absorption is more intense for the more oxidized sample in a pair of samples collected at the same site. The shoulder may be assigned to peroxides, organic carbonates, anhydrides or lactones. It is most probable for alkyl/aryl peroxides and carbonates.



$\mathrm{R{-}\overset{O}{\overset{\|}{C}}{-}O{-}O{-}\overset{O}{\overset{\|}{C}}{-}Ar}$

Peroxide



$\mathrm{R{-}O{-}\overset{O}{\overset{\|}{C}}{-}O{-}Ar}$

Carbonate

A relatively limited variety of anhydrides or lactones would exhibit this absorption, principally five- or six-membered strained cyclic species. Thus, this absorption is probably due to peroxides or carbonates. Organic peroxides might be formed via the free-radical decomposition of peroxyacyl nitrates. Since this absorption cannot be unambiguously assigned, we will refer to it as the "percarbonyl" peak. This is meant to refer to the relatively oxidized character of the candidate compound types, especially the peroxides and carbonates.

As described in the Experimental Methods section of this report the relative intensity for various absorbances has been reduced to numerical form. This was done for the carbonyl peak and the percarbonyl shoulder. Calculated values are shown in Table 8. In each pair of days at a given site, the sample having the higher weight percent oxygen exhibits stronger carbonyl and percarbonyl absorptions. For the two samples collected in New York there is a relatively small difference in weight percent oxygen. This is reflected in correspondingly small differences in the carbonyl and percarbonyl band intensities for the two samples.

Interesting trends in peak intensity were also observed for absorptions at 1630 $\mathrm{cm^{-1}}$ and 1275 $\mathrm{cm^{-1}}$ (Figure 5, Markers C and D). According to Colthup, et al.,(9) organic nitrates ($R{-}O{-}NO_2$) display strong bands near 1660 to 1625 $\mathrm{cm^{-1}}$ ($NO_2$ asymmetric stretching) and 1285 to 1270 $\mathrm{cm^{-1}}$ ($NO_2$ symmetric stretching). Broad absorptions observed at 850 $\mathrm{cm^{-1}}$ are also consistent with organic nitrates. The observed bands, however, might also be attributed to aromatic amines. Nevertheless, the group frequencies for aromatic amines are quite broad. For example, the band due to C-N stretching could appear in the region of 1250 to 1380 $\mathrm{cm^{-1}}$. Most

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(9) Colthup, N. B., Daly, L. H., and Wiberly, S. E., *Introduction to Infrared and Raman Spectroscopy*, Academic Press, New York (1964), p 286.

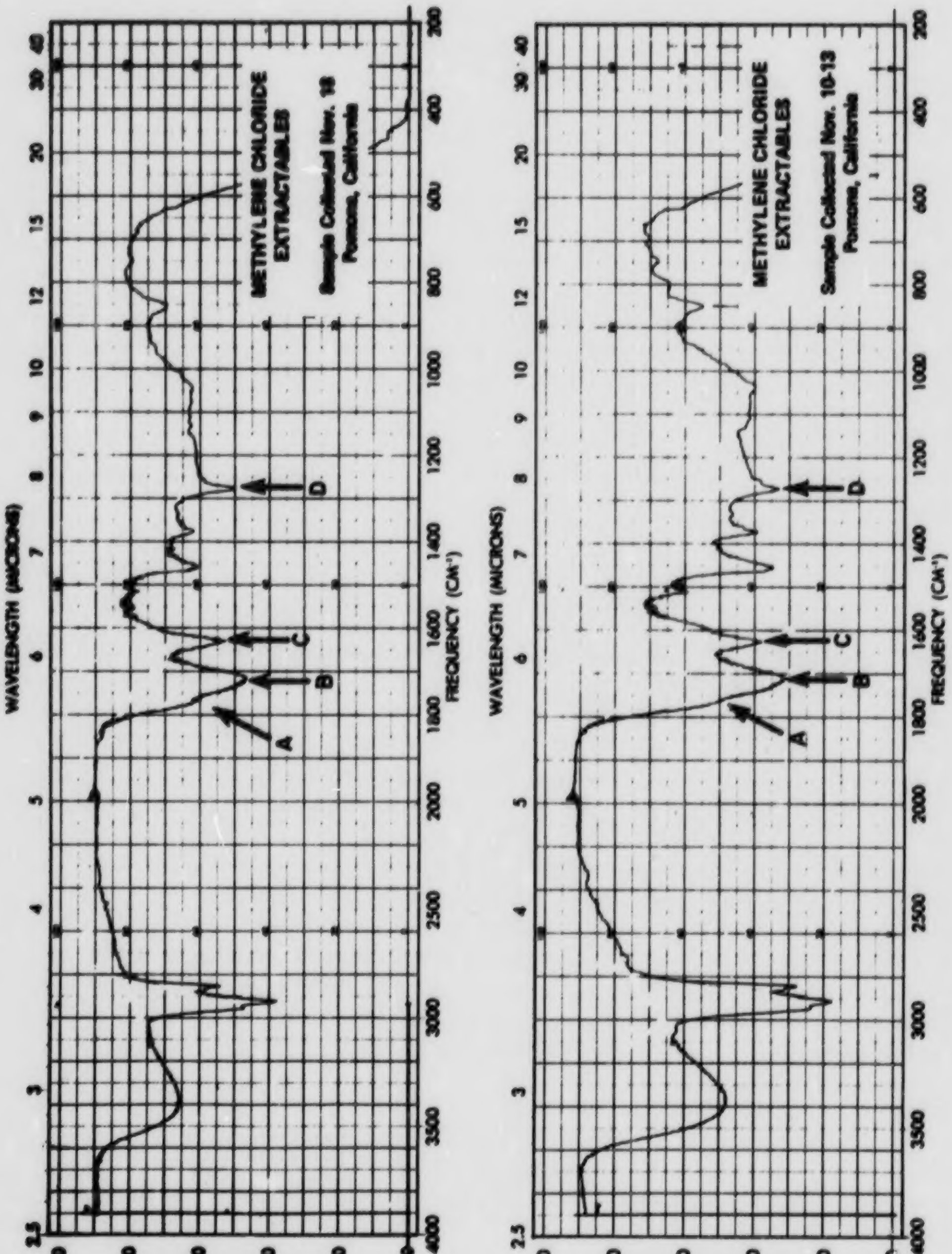

FIGURE 5. INFRARED SPECTRA OF SOLVENT-EXTRACTABLE MATTER

## TABLE 8. COMPARISON OF INFRARED SPECTROSCOPIC DATA AND WEIGHT PERCENT CHN DATA

**Data presented are for methylene chloride extracts.**

| Site | Date | Weight, percent [O] | Carbonyl Band Relative Intensity | Percarbonyl Band[a] Relative Intensity |
|---|---|---|---|---|
| Pomona | Nov. 18 | 28.8 | 0.64 | 0.06 |
| | Nov. 10-13 | 20.5 | 0.51 | 0.03 |
| New York | Aug. 11 | 20.9 | 0.50 | 0.13 |
| | Aug. 23 | 20.7 | 0.47 | 0.14 |
| Columbus | July 21 | 20.4 | 0.58 | 0.16 |
| | July 26 | 15.9 | 0.38 | 0.07 |

| Site | Date | Weight Percent N | Nitrate Band I[b] (1630 $cm^{-1}$) Relative Intensity | Nitrate Band II[b] (1275 $cm^{-1}$) Relative Intensity | Average Intensity, Bands I and II |
|---|---|---|---|---|---|
| Pomona | Nov. 18 | 1.9 | 0.43 | 0.37 | 0.40 |
| | Nov. 10-13 | 1.3 | 0.29 | 0.24 | 0.27 |
| New York | Aug. 11 | 1.3 | 0.25 | 0.28 | 0.27 |
| | Aug. 23 | 1.1 | 0.19 | 0.22 | 0.21 |
| Columbus | July 21 | 0.8 | 0.17 | 0.19 | 0.18 |
| | July 26 | 0.9 | 0.15 | 0.15 | 0.15 |

(a) Refer to text.
(b) Tentative assignments.

primary amines have an $NH_2$ deformation band at 1650 to 1590 $cm^{-1}$, while secondary aromatic amines have an NH bending absorption near 1510 $cm^{-1}$. Most aliphatic secondary amines have no significant NH bending band above 1470 $cm^{-1}$. Thus, although various aromatic amines could give rise to the observed bands at 1275 $cm^{-1}$ and 1630 $cm^{-1}$, these absorptions are more generally assignable to organic nitrates. In considering the data further, we will refer to the observed absorptions as "tentatively assigned" nitrate bands. The relative intensities for these bands are also shown in Table 8. There appears to be a correlation between the weight percent nitrogen in the methylene chloride extractables, and the relative intensity of the bands. This correlation is of interest even if the observed bands arise from aromatic amines.

### Aromatic/Aliphatic Ratio

Aromatic/aliphatic ratio data are expressed as proton-percent aromatic in Table 9. For the New York and Pomona samples, particulate collected during a period of high mass loading has a relatively high aromatic content, while that collected during a period of comparatively low mass loading has an aromatic content below the level of detection (~1 proton percent).

TABLE 9. FOURIER TRANSFORM-NMR ANALYSIS OF METHYLENE CHLORIDE EXTRACTABLES

| Site | Date | Mass Loading, $\mu g/m^3$ | Proton Percent Aromatic |
|---|---|---|---|
| Columbus | July 21 | 69.5 | 9 |
| | July 26 | 34.6 | 10 |
| New York | Aug. 23 | 53.4 | 11 |
| | Aug. 11 | 34.3 | <1 |
| Pomona | Nov. 18 | 52.4 | 13 |
| | Nov. 10-13 | 17.5 | <1 |

Data for the aromatic content of the dioxane extractables has been omitted. It was observed that upon standing, a fine precipitate formed in the concentrated deutero-dioxane solutions, leading to irregular results.

### Acid/Base/Neutral Distribution

The acid/base/neutral fractionation procedure described earlier represents a departure from methods most often employed in such fractionation. To minimize sample losses to the point where meaningful distribution data could be reported for the small samples available, special techniques including vapor-phase drying and continuous liquid/liquid extraction were incorporated in the procedure. As refinement of the scheme progressed, however, it became clear that unacceptable material losses were occurring during fractionation of some samples. Values for the acid/base/neutral distribution have not been reported for cases where the reliability of the results is questionable. Distribution data for two of the samples is of sufficient reliability for inclusion in this report. The results are shown in Table 10.

TABLE 10. FRACTIONATION OF METHYLENE CHLORIDE EXTRACTABLE MATTER

| Site | Date | Mass Distribution, weight percent: Water Insoluble Fraction: Acid | Neutral | Base | Water-Soluble Fraction, Total |
|---|---|---|---|---|---|
| New York | Aug. 11 | 26 | 52 | 4 | 18 |
| | Aug. 23 | 30 | 50 | 5 | 15 |

Typically, about 5 mg of sample was subjected to fractionation, and an overall recovery of approximately 60 percent was achieved. Wet chemical analysis of small samples inevitably results in some random handling losses. The recovery observed here is consistent with the quantity of sample used and the nature of the analytical procedure applied. The losses incurred are acceptably random, and the distribution data obtained appear valid, within confidence limits of approximately 15 percent of reported values.

### Functional-Group Concentrations

The determinations for carbonyl and alcohol were conducted using the neutral fraction of the methylene chloride extracts. Results of functional group analyses are most often expressed in terms of some molar value; i.e., total moles, moles per milligram of sample, etc. This is ideal for the current application, in which an unambiguous measure of specified organic functionalities is desired. To further clarify the results, the molar values for carbonyl and alcohol have been converted to a single common basis, and expressed in terms of weight percent oxygen. This was calculated as shown in the following example:

$$\text{Weight percent carbonyl oxygen} = \frac{(\text{mg [O] present as carbonyl})}{(\text{mg sample})} \times 100 \quad .$$

Expression of the data in this form permits a direct comparison between weight percent carbonyl oxygen, weight percent alcoholic oxygen, and weight percent oxygen obtained from the CHN determination performed on the unfractionated extract. The data expressed in this form are shown in Table 11. In considering the results of the CHN determination, it was noted that incorporation of oxygen into organic particulate may be a useful indicator of the tendency for a given atmosphere to oxidize gas-phase or suspended organics. In seeking statistical correlations between oxygen incorporation and gas-phase data, it will be valuable to consider oxygen incorporation into specific functionalities. In terms of fundamental atmospheric reactions, for example, incorporation of oxygen to yield carbonyl compounds might be related to ozonolysis of olefins while incorporation of oxygen to yield alcohols might be related to free radical reactions. In any event, interpretation of the functional-group-analysis data will have to await forthcoming statistical tasks.

TABLE 11. FUNCTIONAL GROUP ANALYSIS OF METHYLENE CHLORIDE NEUTRAL FRACTION

| Site | Date | Wt % [O] $MeCl_2$ Extract | Alcoholic Oxygen, wt % in neutral fraction | Carbonyl Oxygen, wt % in neutral fraction | Total Oxygen, Alcoholic Plus Carbonyl, wt % |
|---|---|---|---|---|---|
| Columbus | July 21 | 20.4 | 19.3 | 4.9 | 24.2 |
| | July 26 | 15.9 | 5.0 | 5.5 | 10.5 |
| New York | Aug. 23 | 20.7 | 3.0 | 4.2 | 7.2 |
| | Aug. 11 | 20.9 | 4.6 | 5.2 | 9.8 |
| Pomona | Nov. 18 | 28.8 | 4.0 | 7.3 | 11.3 |
| | Nov. 10-13 | 20.5 | 4.4 | 3.2 | 7.6 |

# APPENDIX A

## AIR QUALITY DATA FROM COLUMBUS, OHIO, NEW YORK CITY, AND POMONA, CALIFORNIA

Sampling Site: Fort Hayes, Columbus, Ohio

Sampling Period: July 19, through July 29, 1972

Comments:

(1) The period July 19-21, 1972 was marked by an unusual inversion in the area, the remaining period was more typical of summer conditions.

(2) Data obtained prior to July 26 was not suitably formatted for the profile routine.

```
          SUBSTANCE                           AVERAGE FOR JULY 19, 1972


 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                 0.213
 7--WIND SPEED (MPH)                                  2.144
 8--WIND DIRECTION (DEGREES)                        164.876
 9--TEMPERATURE (CENTIGRADE)                         26.810
10--RELATIVE HUMIDITY (PERCENT)                      71.270
11--LIGHT SCATTERING ((10**-4)/M)                     5.169
12--SULFUR DIOXIDE (PPM)                              0.018
13--OZONE (PPM)                                       0.019
14--NITRIC OXIDE (PPM)                                0.042
15--NITROGEN DIOXIDE (PPM)                            0.056
16--NITROGEN OXIDES (PPM)                             0.102
17--CARBON MONOXIDE (PPM)                             1.890
18--METHANE (PPM)                                     1.782
19--TOTAL HYDROCARBON (PPM)                           3.348
30--NON-METHANE HYDROCARBON (PPM)                     1.370



          SUBSTANCE                           MAX CONCENTRATION  HOUR  FOR JULY 19, 1972


11--LIGHT SCATTERING ((10**-4)/M)                   8.757          7
12--SULFUR DIOXIDE (PPM)                            0.046         11
13--OZONE (PPM)                                     0.083         12
14--NITRIC OXIDE (PPM)                              0.147         17
15--NITROGEN DIOXIDE (PPM)                          0.137         17
16--NITROGEN OXIDES (PPM)                           0.296         17
17--CARBON MONOXIDE (PPM)                           6.116         17
NO READINGS TAKEN FOR CHANNEL 20
NO READINGS TAKEN FOR CHANNEL 21
30--NON-METHANE HYDROCARBON (PPM)                   2.523         17
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          SUBSTANCE                        AVERAGE FCR JULY 20, I972


 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                 0.337
 7--WIND SPEED (MPH)                                  1.979
 8--WIND DIRECTION (DEGREES)                        157.310
 9--TEMPERATURE (CENTIGRADE)                         29.061
10--RELATIVE HUMIDITY (PERCENT)                      65.663
11--LIGHT SCATTERING ((10**-4)/M)                     7.280
12--SULFUR DIOXIDE (PPM)                              0.018
13--OZONE (PPM)                                       0.054
14--NITRIC OXIDE (PPM)                                0.063
15--NITROGEN DIOXIDE (PPM)                            0.039
16--NITROGEN OXIDES (PPM)                             0.106
17--CARBON MONOXIDE (PPM)                             1.711
18--METHANE (PPM)                                     1.855
19--TOTAL HYDROCARBON (PPM)                           3.391
30--NON-METHANE HYDROCARBON (PPM)                     1.536




          SUBSTANCE                        MAX CONCENTRATION  HOUR  FOR JULY 20, I972


11--LIGHT SCATTERING ((10**-4)/M)               13.287          6
12--SULFUR DIOXIDE (PPM)                         0.041         15
13--OZONE (PPM)                                  0.143         14
14--NITRIC OXIDE (PPM)                           0.333          8
15--NITROGEN DIOXIDE (PPM)                       0.107          8
16--NITROGEN OXIDES (PPM)                        0.436          8
17--CARBON MONOXIDE (PPM)                        5.380          8
NO REACINGS TAKEN FOR CHANNEL 20
NO REACINGS TAKEN FOR CHANNEL 21
30--NON-METHANE HYDROCARBON (PPM)                2.377          1
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          SUBSTANCE                    AVERAGE FOR JULY 21, 1972

 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)             0.335
 7--WIND SPEED (MPH)                              2.708
 8--WIND DIRECTION (DEGREES)                    217.934
 9--TEMPERATURE (CENTIGRADE)                     29.987
10--RELATIVE HUMIDITY (PERCENT)                  63.852
11--LIGHT SCATTERING ((10**-4)/M)                 5.858
12--SULFUR DIOXIDE (PPM)                          0.020
13--OZONE (PPM)                                   0.046
14--NITRIC OXIDE (PPM)                            0.006
15--NITROGEN DIOXIDE (PPM)                        0.022
16--NITROGEN OXIDES (PPM)                         0.026
17--CARBON MONOXIDE (PPM)                         1.035
18--METHANE (PPM)                                 1.788
19--TOTAL HYDROCARBON (PPM)                       3.396
30--NON-METHANE HYDROCARBON (PPM)                 1.657


          SUBSTANCE                    MAX CONCENTRATION  HOUR  FOR JULY 21, 1972

11--LIGHT SCATTERING ((10**-4)/M)              9.453         6
12--SULFUR DIOXIDE (PPM)                       0.043        18
13--OZONE (PPM)                                0.117        13
14--NITRIC OXIDE (PPM)                         0.088        13
15--NITROGEN DIOXIDE (PPM)                     0.148        22
16--NITROGEN OXIDES (PPM)                      0.164        22
17--CARBON MONOXIDE (PPM)                      2.293         8
NO READINGS TAKEN FOR CHANNEL 20
NO READINGS TAKEN FOR CHANNEL 21
30--NON-METHANE HYDROCARBON (PPM)              4.710         0
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          SUBSTANCE                          AVERAGE FCR JULY 22, 1972

 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                    0.300
 7--WIND SPEED (MPH)                                     2.544
 8--WIND DIRECTION (DEGREES)                           182.412
 9--TEMPERATURE (CENTIGRADE)                            29.276
10--RELATIVE HUMIDITY (PERCENT)                         66.946
11--LIGHT SCATTERING ((10**-4)/M)                        5.594
12--SULFUR DIOXIDE (PPM)                                 0.027
13--OZONE (PPM)                                          0.031
14--NITRIC OXIDE (PPM)                                   0.045
15--NITROGEN CIOXIDE (PPM)                               0.103
16--NITROGEN OXIDES (PPM)                                0.109
17--CARBON MONOXIDE (PPM)                                1.589
18--METHANE (PPM)                                        1.963
19--TOTAL HYDROCARBON (PPM)                              3.525
30--NON-METHANE HYDROCARBON (PPM)                        1.562


          SUBSTANCE                          MAX CONCENTRATION  HOUR  FOR JULY 22, 1972

11--LIGHT SCATTERING ((10**-4)/M)                  9.063          4
12--SULFUR DIOXIDE (PPM)                           0.039         23
13--OZONE (PPM)                                    0.079         12
14--NITRIC OXIDE (PPM)                             0.207          3
15--NITROGEN DIOXIDE (PPM)                         0.204          0
16--NITROGEN OXIDES (PPM)                          0.365          2
17--CARBON MONCXIDE (PPM)                          4.532          2
NC READINGS TAKEN FOR CHANNEL 20
NO READINGS TAKEN FOR CHANNEL 21
30--NON-METHANE HYDROCARBON (PFM)                  3.087          2
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          SUBSTANCE                        AVERAGE FCR JULY 23, 1972

 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                0.395
 7--WIND SFEEC (MPH)                                 3.698
 8--WIND DIRECTION (DEGREES)                       248.002
 9--TEMFERATURE (CENTIGRADE)                        29.340
10--RELATIVE HUMIDITY (PERCENT)                     62.037
11--LIGHT SCATTERING ((10**-4)/M)                    3.332
12--SULFUR DIOXIDE (PPM'                             0.023
13--OZONE (PPM)                                      0.043
14--NITRIC OXICE (PPM)                               0.002
15--NITROGEN CIOXIDE (PPM)                           0.043
16--NITROGEN OXIDES (PPM)                            0.031
17--CARBON MONOXIDE (PPM)                            0.926
18--METHANE (PPM)                                    1.656
19--TOTAL HYDROCARBON (PPM)                          3.141
30--NON-METHANE HYDROCARBON (PPM)                    1.485



          SUBSTANCE                        MAX CONCENTRATION  HOUR  FOR JULY 23, 1972

11--LIGHT SCATTERING ((10**-4)/M)                7.313          7
12--SULFUR DIOXIDE (PPM)                         0.036          0
13--OZONE (PPM)                                  0.089         17
14--NITRIC OXICE (PPM)                           0.013          1
15--NITROGEN CIOXIDE (PPM)                       0.067          1
16--NITROGEN OXIDES (PPM)                        0.115          1
17--CARBON MONOXIDE (PPM)                        2.120          2
NC READINGS TAKEN FOR CHANNEL 20
NO READINGS TAKEN FOR CHANNEL 21
30--NON-METHANE HYDROCARBON (PPM)                2.273         21
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         SUBSTANCE                          AVERAGE FOR JULY 24, 1972


 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                 0.314
 7--WIND SPEED (MPH)                                  2.893
 8--WIND DIRECTION (DEGREES)                        225.531
 9--TEMPERATURE (CENTIGRADE)                         25.881
10--RELATIVE HUMIDITY (PERCENT)                      68.364
11--LIGHT SCATTERING ((10**-4)/M)                     1.327
12--SULFUR DIOXIDE (PPM)                              0.018
13--OZONE (PPM)                                       0.035
17--CARBON MONOXIDE (PPM)                             0.974
18--METHANE (PPM)                                     1.511
19--TOTAL HYDROCARBON (PPM)                           2.888
30--NON-METHANE HYDROCARBON (PPM)                     1.310



         SUBSTANCE                          MAX CONCENTRATION  HOUR  FOR JULY 24, 1972


11--LIGHT SCATTERING ((10**-4)/M)                  2.467          2
12--SULFUR DIOXIDE (PPM)                           0.036         18
13--OZONE (PPM)                                    0.095         13
NO READINGS TAKEN FOR CHANNEL 14
NO READINGS TAKEN FOR CHANNEL 15
NO READINGS TAKEN FOR CHANNEL 16
17--CARBON MONOXIDE (PPM)                          1.637          8
NO READINGS TAKEN FOR CHANNEL 20
NO READINGS TAKEN FOR CHANNEL 21
30--NON-METHANE HYDROCARBON (PPM)                  3.700         14
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          SUBSTANCE                        AVERAGE FOR JULY 26, 1972

  6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)               0.277
  7--WIND SPEED (MPH)                                2.414
  8--WIND DIRECTION (DEGREES)                      160.282
  9--TEMPERATURE (CENTIGRADE)                       21.881
 11--LIGHT SCATTERING ((10**-4)/M)                   1.655
 12--SULFUR DIOXIDE (PPM)                            0.020
 13--OZONE (PPM)                                     0.028
 17--CARBON MONOXIDE (PPM)                           0.904
 18--METHANE (PPM)                                   1.629
 19--TOTAL HYDROCARBON (PPM)                         2.927
 20--ETHYLENE (PPM)                                  0.007
 21--ACETYLENE (PPM)                                 0.004
 30--NON-METHANE HYDROCARBON (PPM)                   1.298


          SUBSTANCE                        MAX CONCENTRATION  HOUR  FOR JULY 26, 1972

 11--LIGHT SCATTERING ((10**-4)/M)              2.817          5
 12--SULFUR DIOXIDE (PPM)                       0.039          5
 13--OZONE (PPM)                                0.087         15
 NO READINGS TAKEN FOR CHANNEL 14
 NC READINGS TAKEN FOR CHANNEL 15
 NO READINGS TAKEN FOR CHANNEL 16
 17--CARBON MONOXIDE (PPM)                      2.847          8
 20--ETHYLENE (PPM)                             0.016          7
 21--ACETYLENE (PPM)                            0.008          7
                                                               8
                                                              19
 30--NON-METHANE HYDROCARBON (PPM)              2.020          5
```
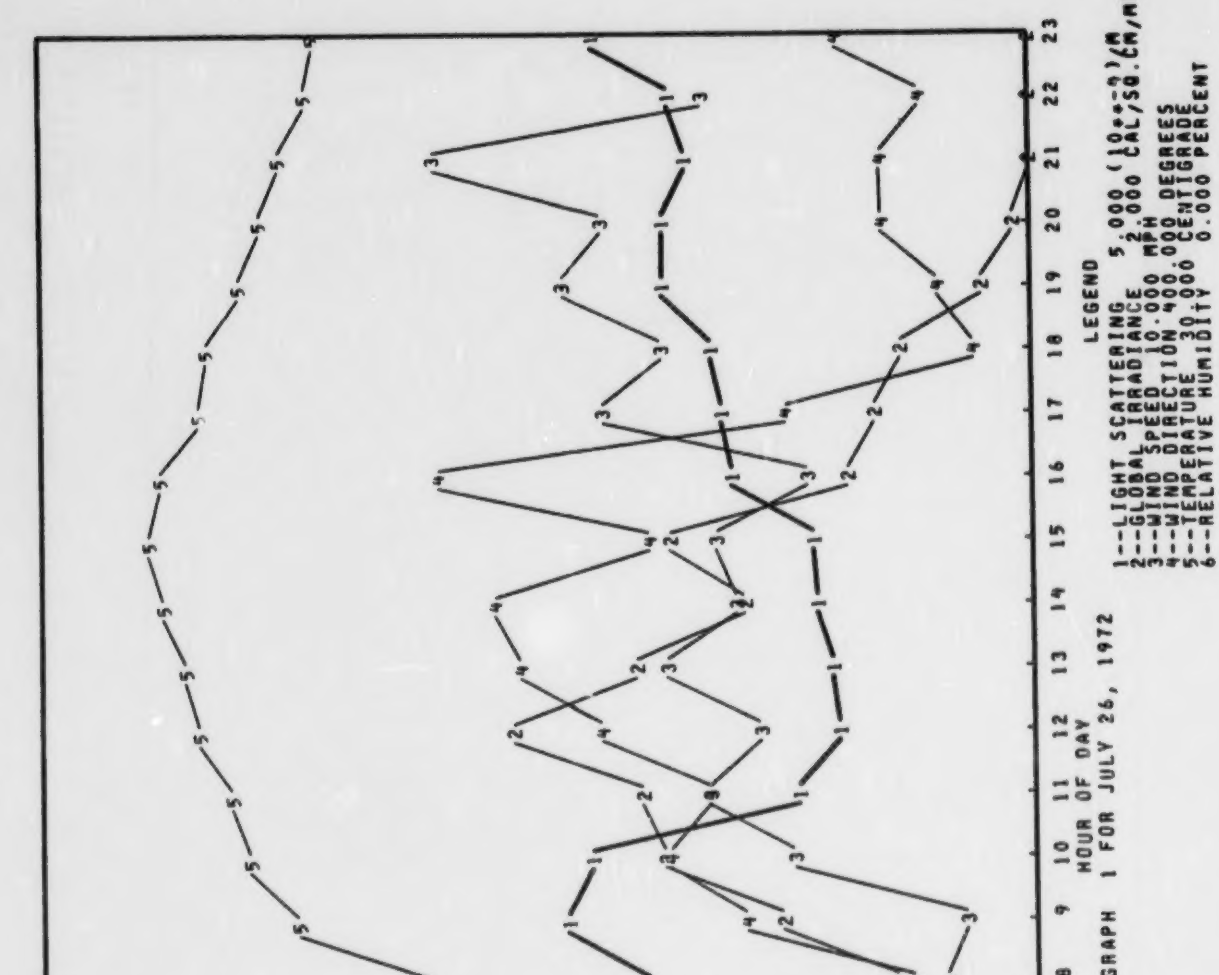
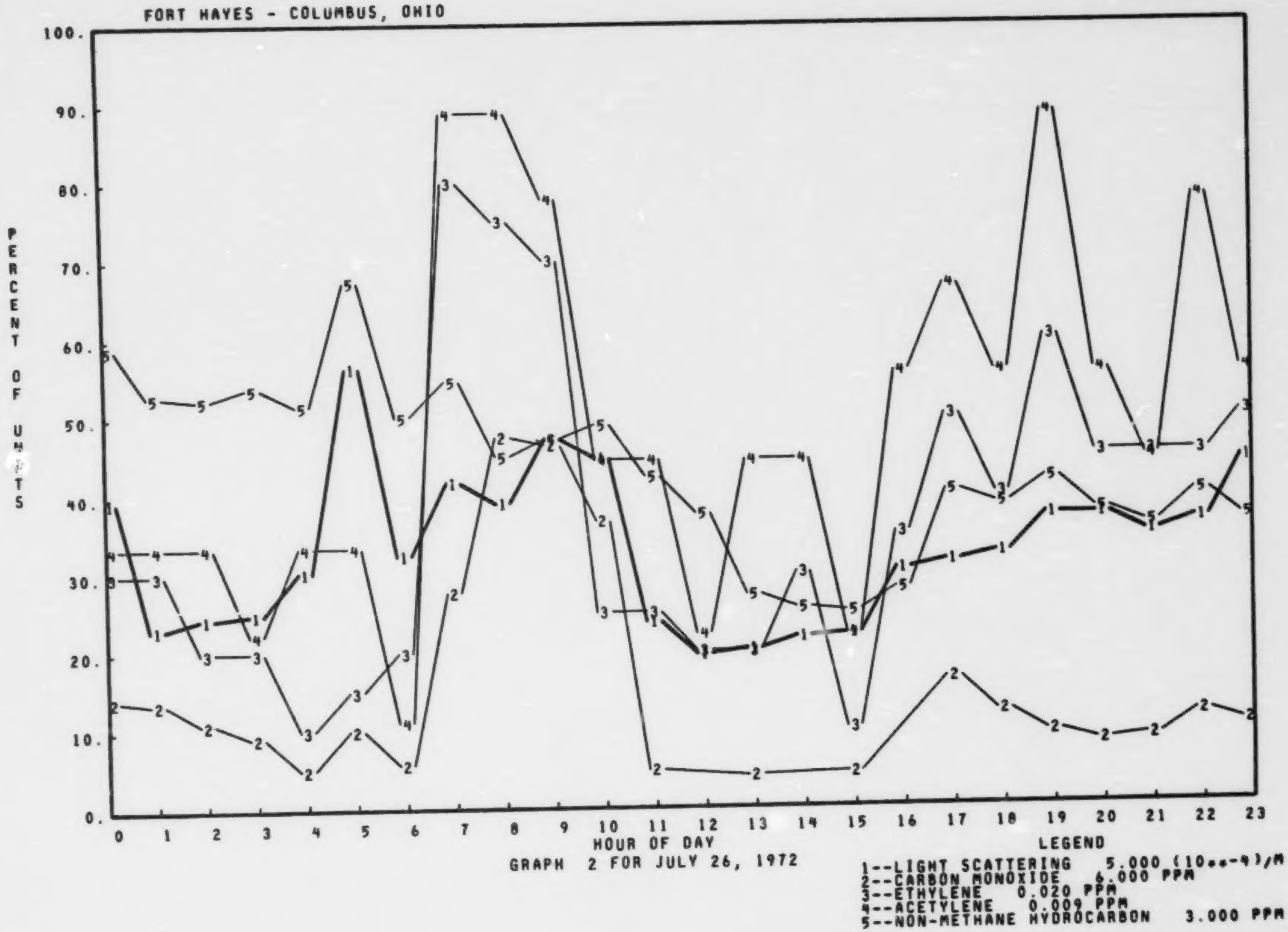
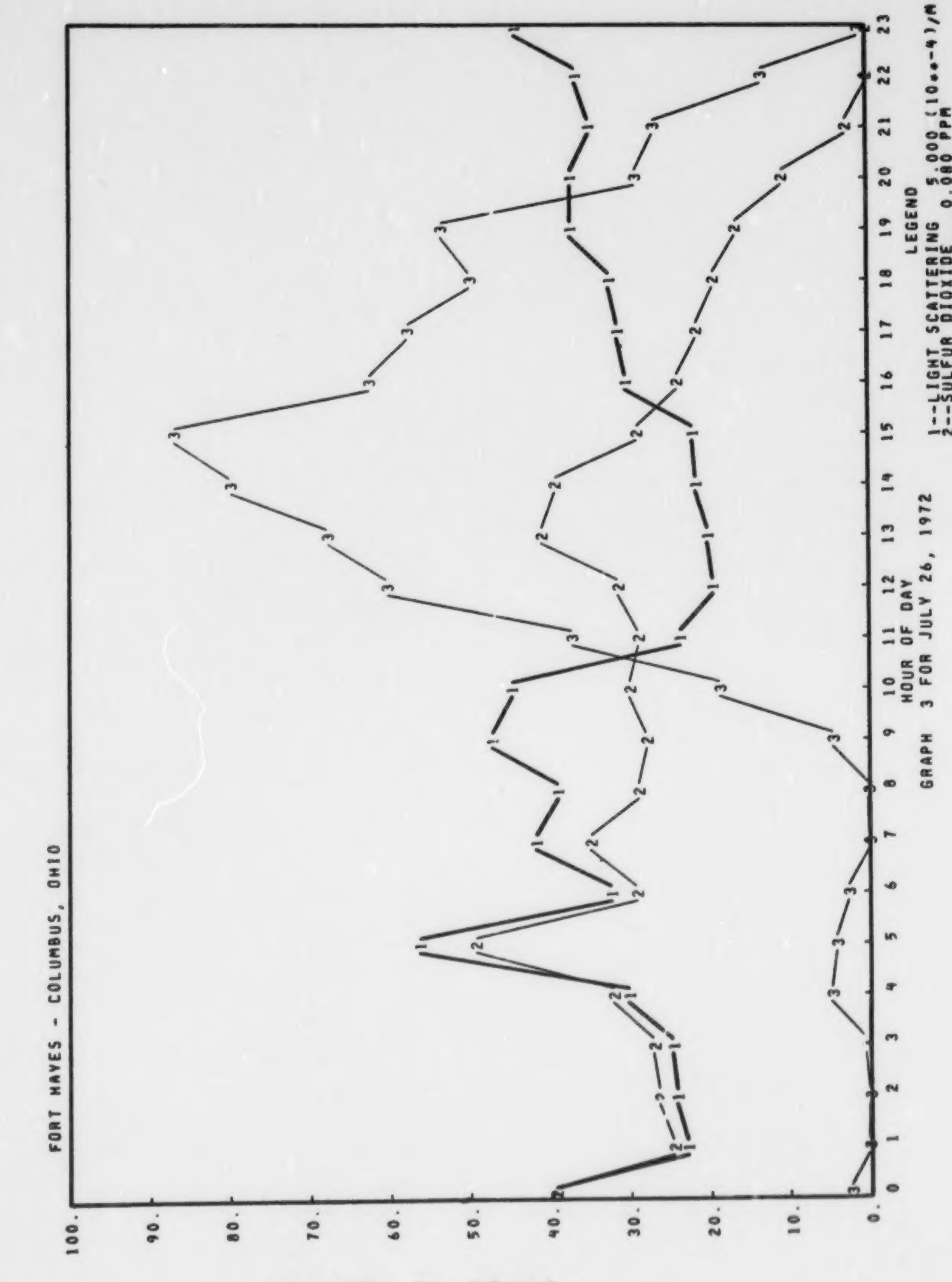



GRAPH 1 FOR JULY 26, 1972



GRAPH 2 FOR JULY 26, 1972



GRAPH 3 FOR JULY 26, 1972

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        SUBSTANCE                          AVERAGE FCR JULY 27, 1972


  6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                 0.184
  7--WIND SPEED (MPH)                                  3.584
  8--WIND DIRFCTION (DEGREES)                        121.524
  9--TEMPERATURE (CENTIGRADE)                         22.312
 11--LIGHT SCATTERING ((10**-4)/M)                     4.724
 12--SULFUR DIOXIDE (PPM)                              0.014
 13--OZONE (PPM)                                       0.036
 17--CARBON MONCXIDE (PPM)                             0.788
 18--METHANE (PPM)                                     1.564
 19--TOTAL HYDROCARBON (PPM)                           2.672
 20--ETHYLENE (PPM)                                    0.008
 21--ACETYLENE (PPM)                                   0.004
 30--NON-METHANE HYDROCARBON (PPM)                     0.969



        SUBSTANCE                          MAX CONCENTRATION  HOUR  FOR JULY 27, 1972


 11--LIGHT SCATTERING ((10**-4)/M)               7.133         19
 12--SULFUR DICXIDE (PPM)                        0.037         23
 13--OZONE (PPM)                                 0.099         14
 NC READINGS TAKEN FOR CHANNEL 14
 NO READINGS TAKEN FOR CHANNEL 15
 NC READINGS TAKEN FOR CHANNEL 16
 17--CARBON MONOXIDE (PPM)                       2.337          8
 20--ETHYLENE (PPM)                              0.020          8
 21--ACETYLENE (PPM)                             0.011          8
 30--NON-METHANE HYDROCARBON (PFM)               1.340          8
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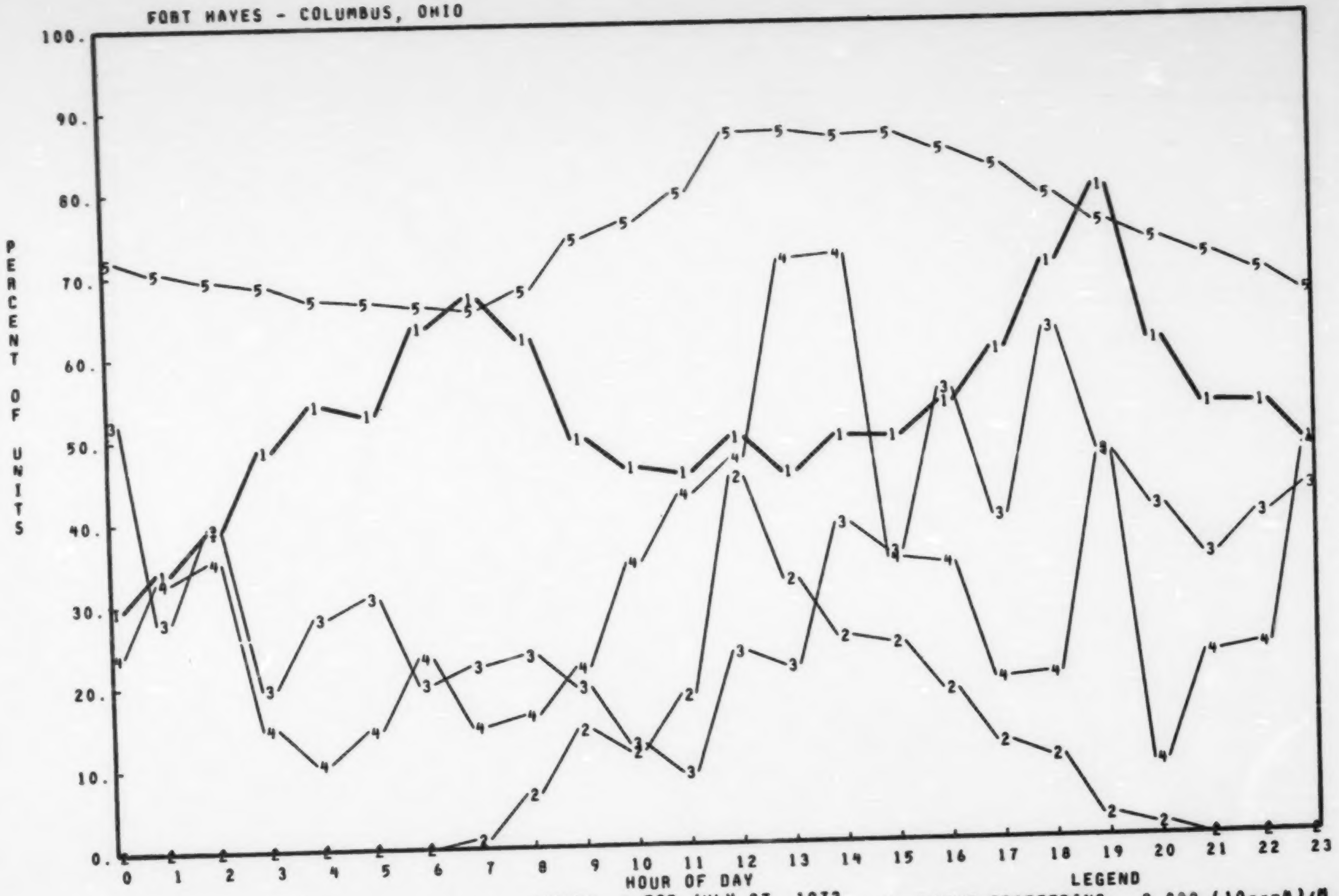
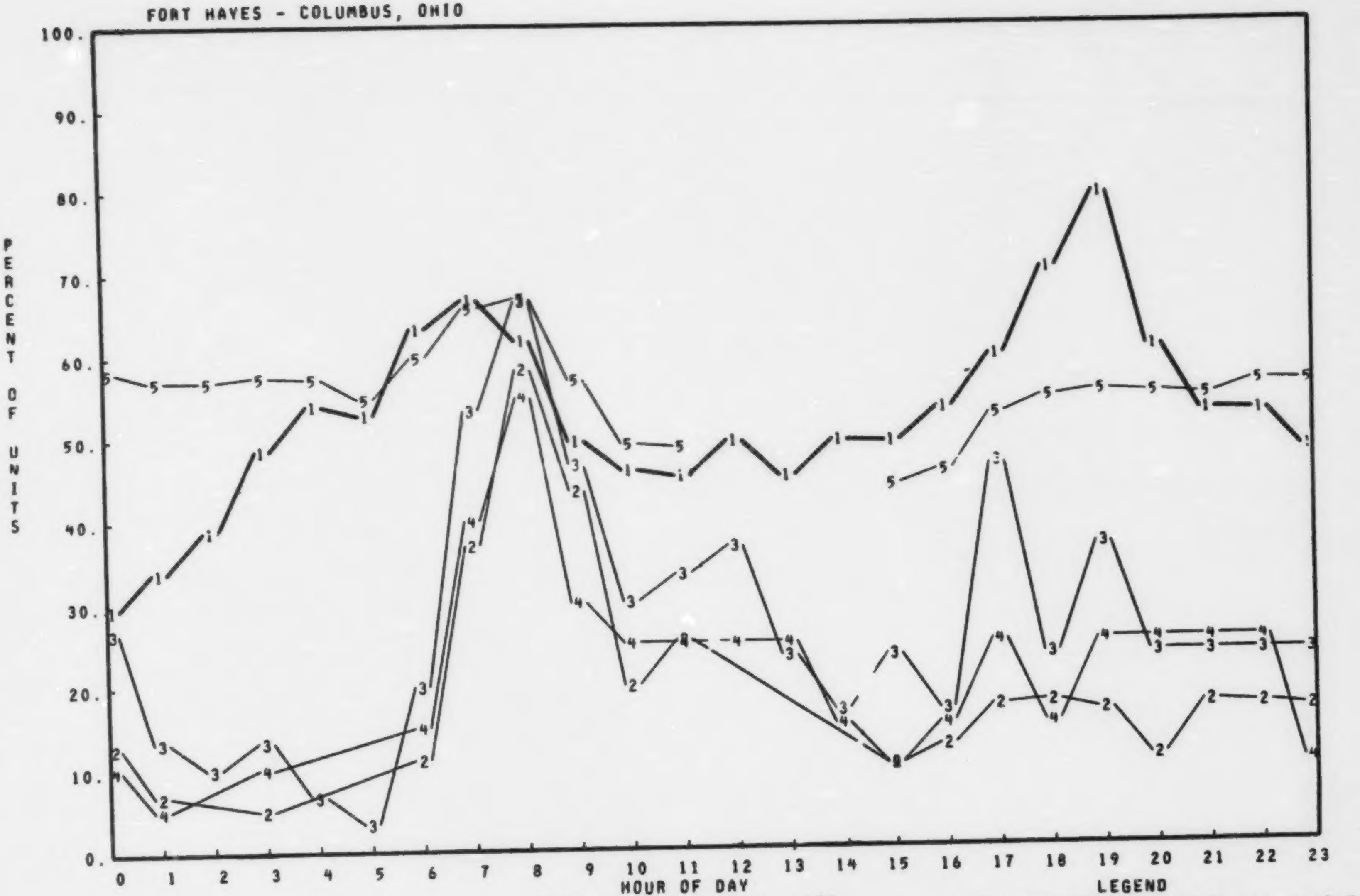


GRAPH 1 FOR JULY 27, 1972



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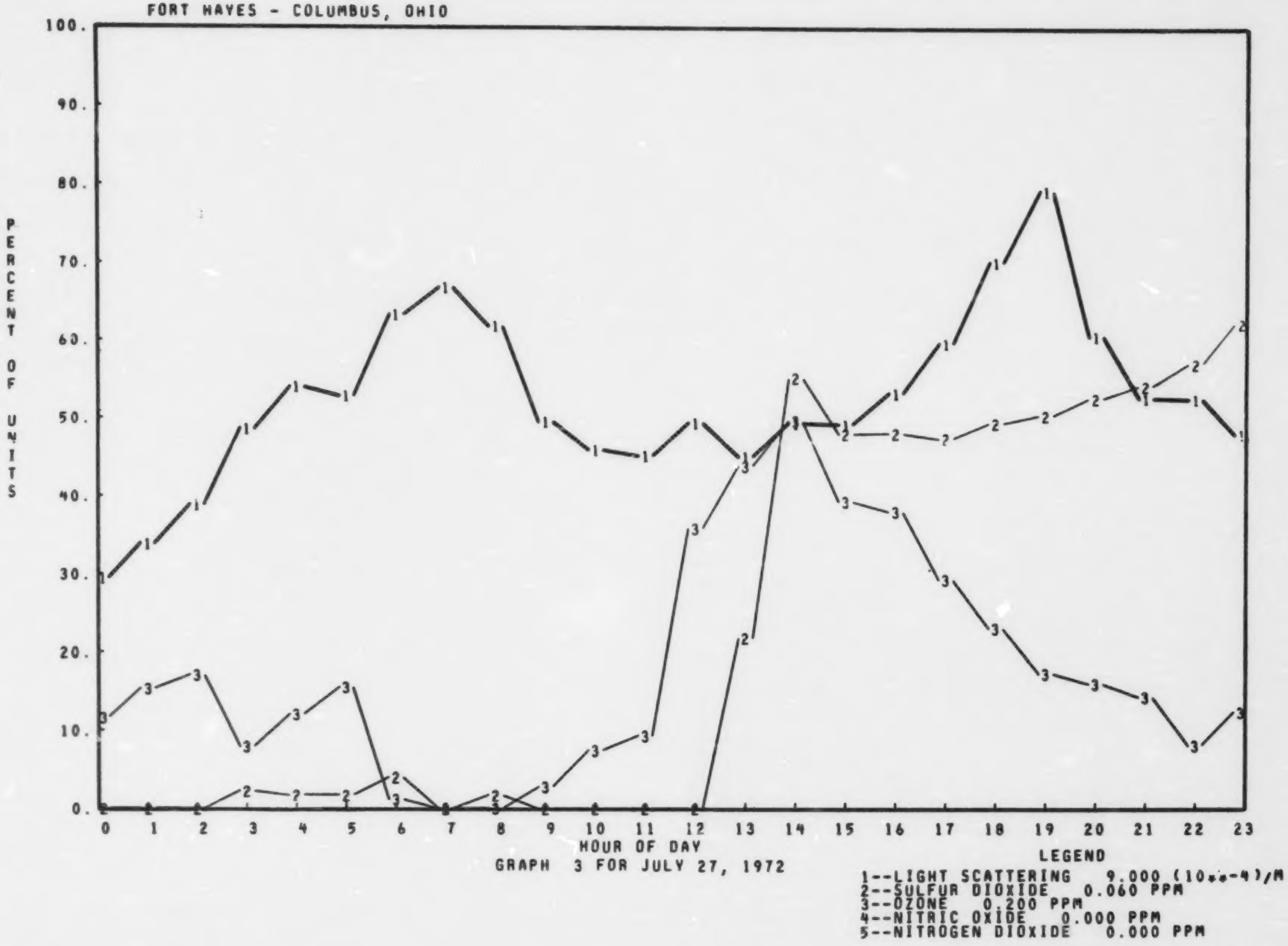

GRAPH 3 FOR JULY 27, 1972

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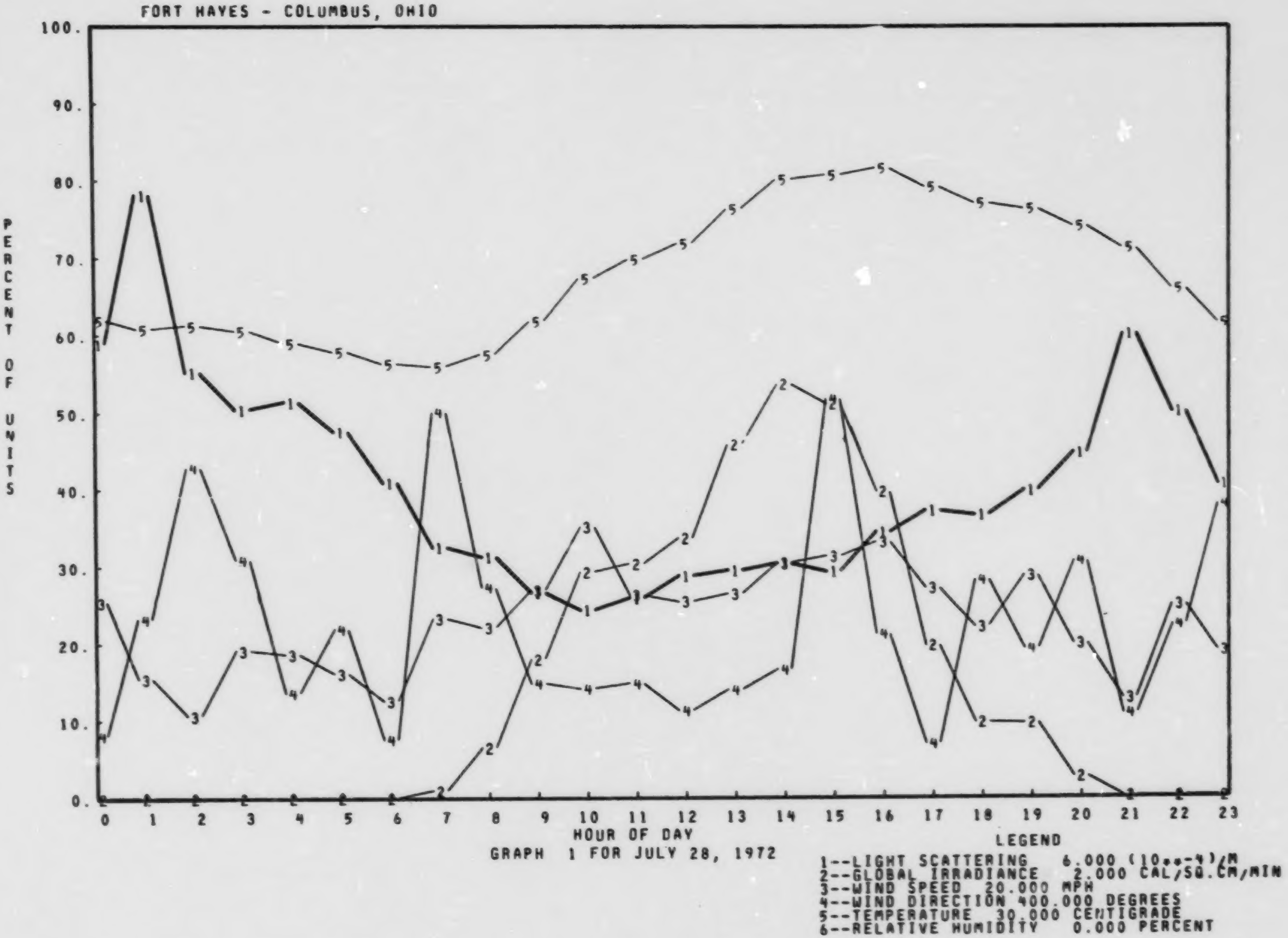
        SUBSTANCE                        AVERAGE FOR JULY 28, 1972

 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)               0.293
 7--WIND SPEED (MPH)                                4.619
 8--WIND DIRECTION (DEGREES)                       90.211
 9--TEMPERATURE (CENTIGRADE)                       20.337
11--LIGHT SCATTERING ((10**-4)/M)                   2.465
12--SULFUR DIOXIDE (PPM)                            0.034
13--OZONE (PPM)                                     0.025
17--CARBON MONOXIDE (PPM)                           0.689
18--METHANE (PPM)                                   1.429
19--TOTAL HYDROCARBON (PPM)                         2.472
20--ETHYLENE (PPM)                                  0.007
21--ACETYLENE (PPM)                                 0.003
30--NON-METHANE HYDROCARBON (PPM)                   0.608



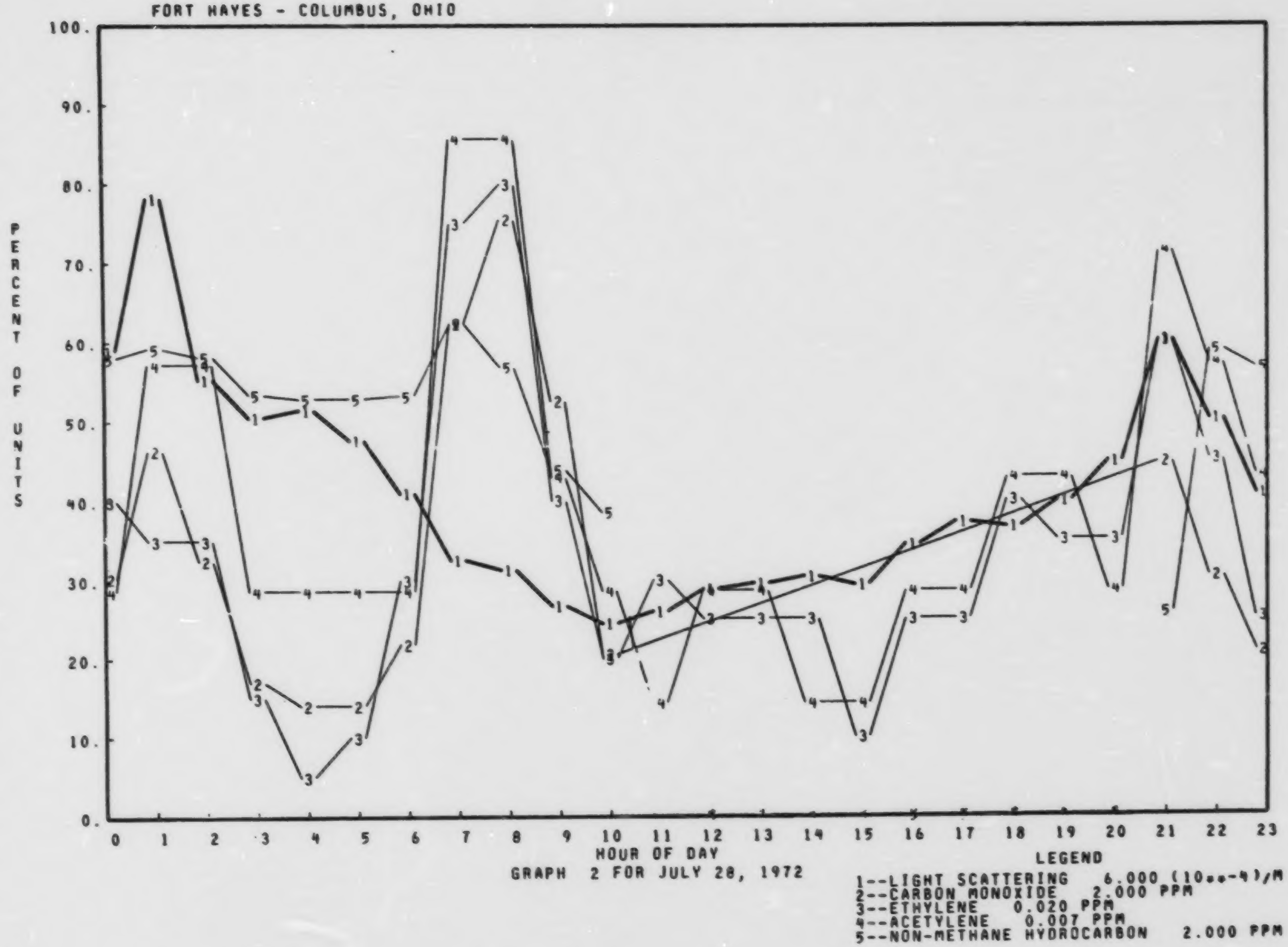
        SUBSTANCE                        MAX CONCENTRATION  HOUR  FOR JULY 28, 1972

11--LIGHT SCATTERING ((10**-4)/M)               4.693          1
12--SULFUR DIOXIDE (PPM)                        0.043          9
13--OZONE (PPM)                                 0.064         15
NO READINGS TAKEN FOR CHANNEL 14
NO READINGS TAKEN FOR CHANNEL 15
NO READINGS TAKEN FOR CHANNEL 16
17--CARBON MONOXIDE (PPM)                       1.510          8
20--ETHYLENE (PPM)                              0.016          8
21--ACETYLENE (PPM)                             0.006          7
                                                               8
30--NON-METHANE HYDROCARBON (PPM)               1.247          7
```



GRAPH 1 FOR JULY 28, 1972

FORT HAYES - COLUMBUS, OHIO



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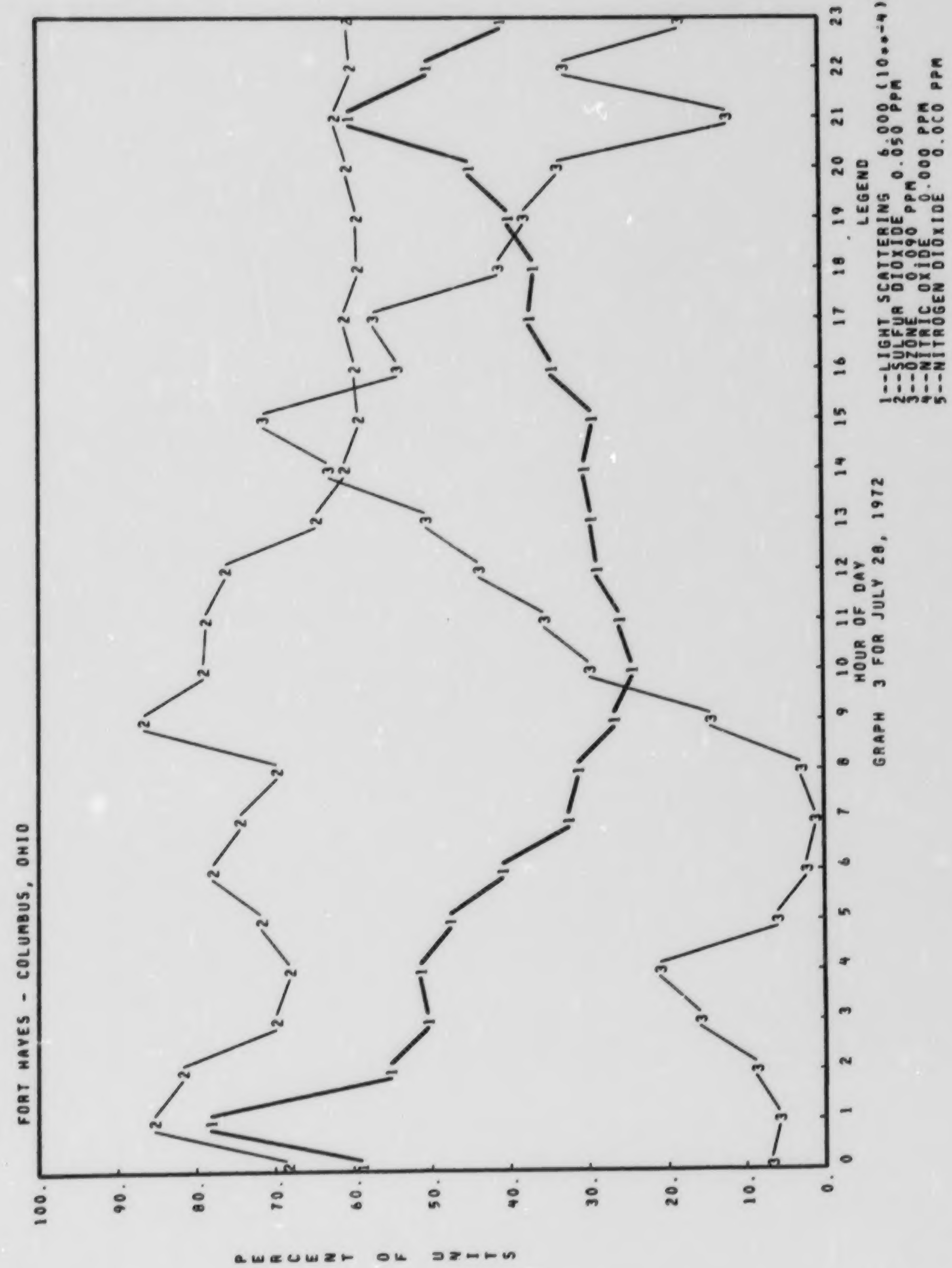

GRAPH 3 FOR JULY 28, 1972

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          SUBSTANCE                          AVERAGE FOR JULY 29, 1972

 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                   0.273
 7--WIND SPEED (MPH)                                    4.532
 8--WIND DIRECTION (DEGREES)                           98.479
 9--TEMPERATURE (CENTIGRADE)                           19.367
11--LIGHT SCATTERING ((10**-4)/M)                       2.088
12--SULFUR DIOXIDE (PPM)                                0.031
13--OZONE (PPM)                                         0.019
17--CARBON MONOXIDE (PPM)                               0.390
18--METHANE (PPM)                                       1.405
19--TOTAL HYDROCARBON (PPM)                             2.728
20--ETHYLENE (PPM)                                      0.004
21--ACETYLENE (PPM)                                     0.002
30--NON-METHANE HYDROCARBON (PPM)                       1.324



          SUBSTANCE                          MAX CONCENTRATION  HOUR  FOR JULY 29, 1972

11--LIGHT SCATTERING ((10**-4)/M)                 2.743          23
12--SULFUR DIOXIDE (PPM)                          0.043          10
13--OZONE (PPM)                                   0.050          14
NO READINGS TAKEN FOR CHANNEL 14
NO READINGS TAKEN FOR CHANNEL 15
NO READINGS TAKEN FOR CHANNEL 16
17--CARBON MONOXIDE (PPM)                         0.880          22
20--ETHYLENE (PPM)                                0.008           0
21--ACETYLENE (PPM)                               0.003           0
                                                                  7
                                                                  8
                                                                  9
30--NON-METHANE HYDROCARBON (PPM)                 1.567          23
```
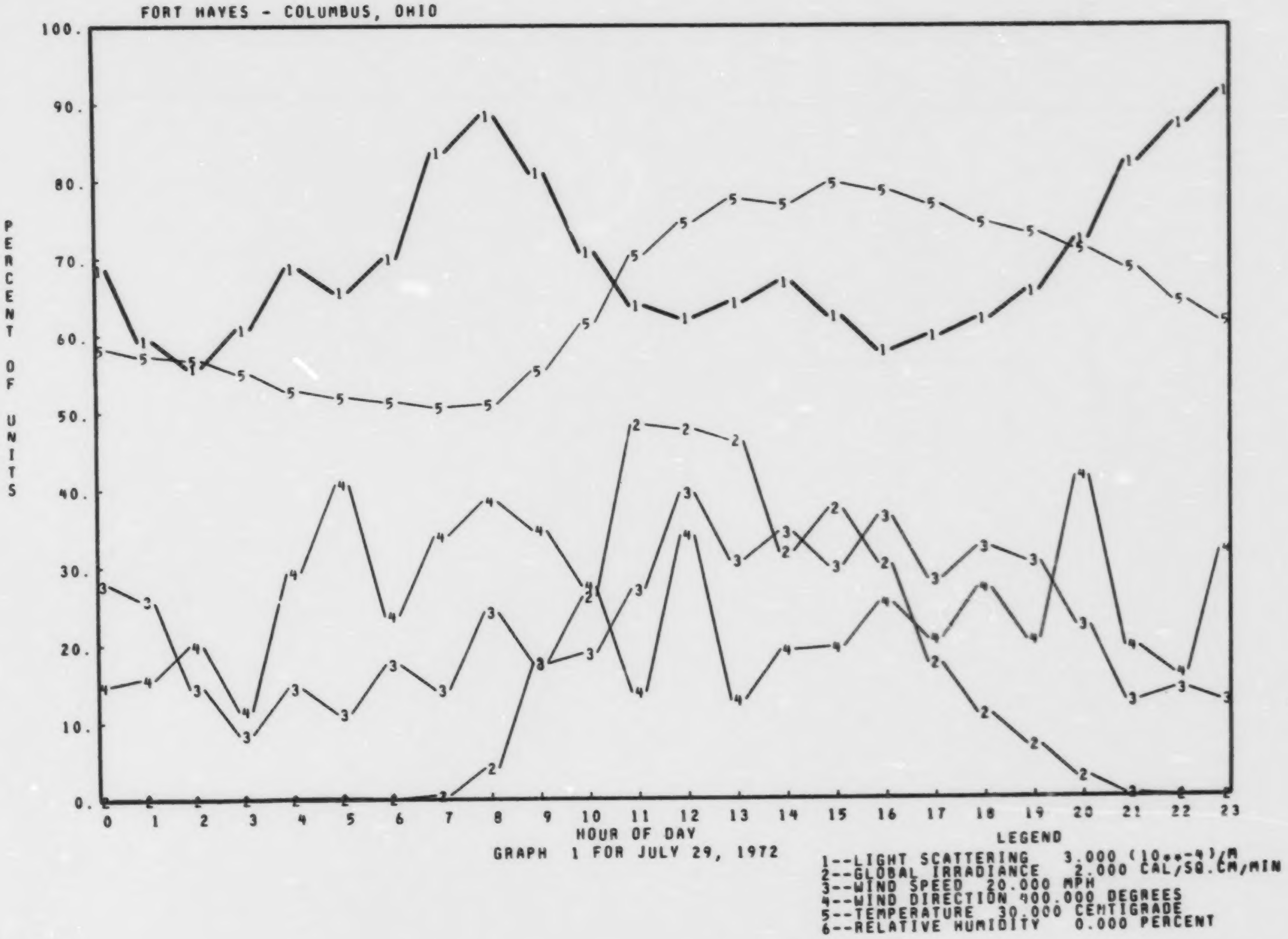
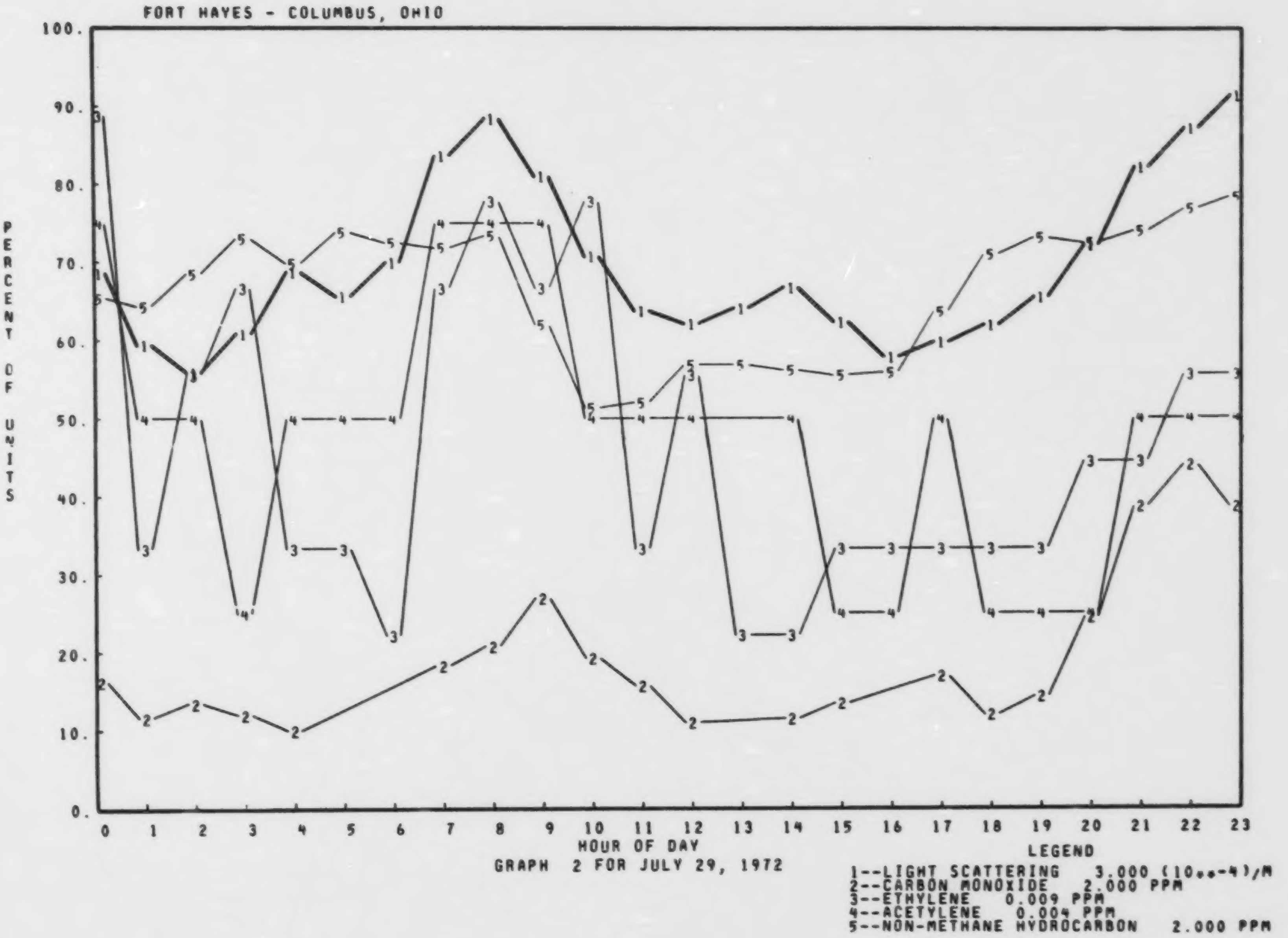



GRAPH 1 FOR JULY 29, 1972



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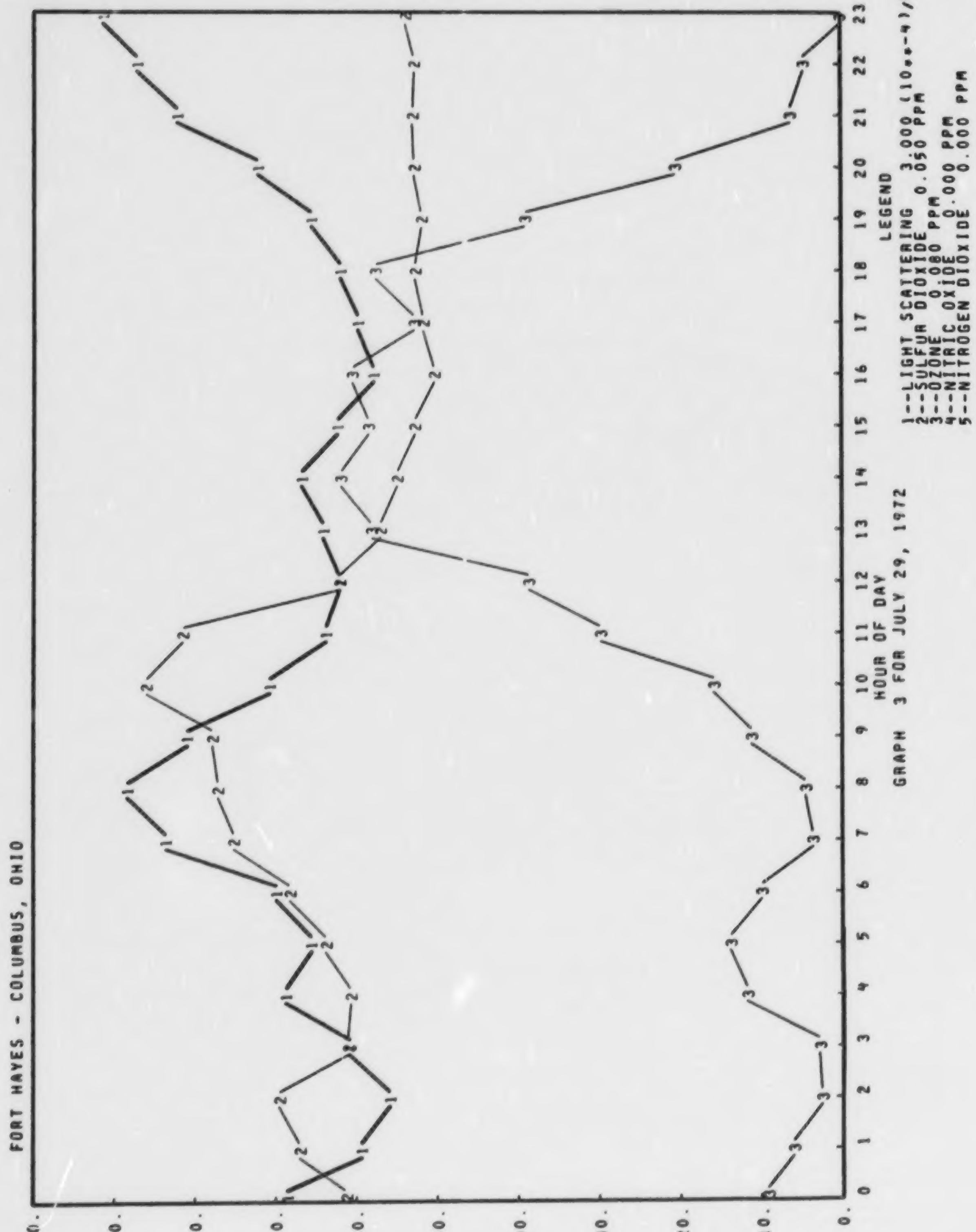

GRAPH 3 FOR JULY 29, 1972

Sampling Site: Welfare Island (East River) in
New York City

Sampling Period: August 7, through August 30, 1972

Comments:

Good weather, clear to somewhat hazy days, good ventilation, very little rainfall.

```
        SUBSTANCE                          AVERAGE FOR AUGUST 7, 1972


 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                    0.270
 7--WIND SPEED (MPH)                                     5.920
 8--WIND DIRECTION (DEGREES)                           230.843
 9--TEMPERATURE (CENTIGRADE)                            25.135
10--RELATIVE HUMIDITY (PERCENT)                         69.381
11--LIGHT SCATTERING ((10**-4)/M)                        2.635
12--SULFUR DIOXIDE (PPM)                                 0.021
13--OZONE (PPM)                                          0.029
17--CARBON MONOXIDE (PPM)                                1.116
18--METHANE (PPM)                                        1.703
19--TOTAL HYDROCARBON (PPM)                              3.296
20--ETHYLENE (PPM)                                       0.001
21--ACETYLENE (PPM)                                      0.001
30--NON-METHANE HYDROCARBON (PPM)                        1.553



        SUBSTANCE                          MAX CONCENTRATION  HOUR  FOR AUGUST 7, 1972


11--LIGHT SCATTERING ((10**-4)/M)                     4.410        21
12--SULFUR DIOXIDE (PPM)                              0.035         8
13--OZONE (PPM)                                       0.082        14
NO READINGS TAKEN FOR CHANNEL 14
NO READINGS TAKEN FOR CHANNEL 15
NO READINGS TAKEN FOR CHANNEL 16
17--CARBON MONOXIDE (PPM)                             3.600        14
20--ETHYLENE (PPM)                                    0.001         6
21--ACETYLENE (PPM)                                   0.001         6
30--NON-METHANE HYDROCARBON (PPM)                     3.820        11
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```
          SUBSTANCE                      AVERAGE FOR AUGUST 10, 1972

 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)           0.354
 7--WIND SPEED (MPH)                            6.697
 8--WIND DIRECTION (DEGREES)                  201.138
 9--TEMPERATURE (CENTIGRADE)                   18.855
10--RELATIVE HUMIDITY (PERCENT)                48.065
11--LIGHT SCATTERING ((10**-4)/M)               0.884
12--SULFUR DIOXIDE (PPM)                        0.019
13--OZONE (PPM)                                 0.014
14--NITRIC OXIDE (PPM)                          0.035
15--NITROGEN DIOXIDE (PPM)                      0.017
16--NITROGEN OXIDES (PPM)                       0.055
17--CARBON MONOXIDE (PPM)                       0.821
18--METHANE (PPM)                               1.616
19--TOTAL HYDROCARBON (PPM)                     3.742
20--ETHYLENE (PPM)                              0.011
21--ACETYLENE (PPM)                             0.006
30--NON-METHANE HYDROCARBON (PPM)               2.127


          SUBSTANCE                      MAX CONCENTRATION  HOUR  FOR AUGUST 10, 1972

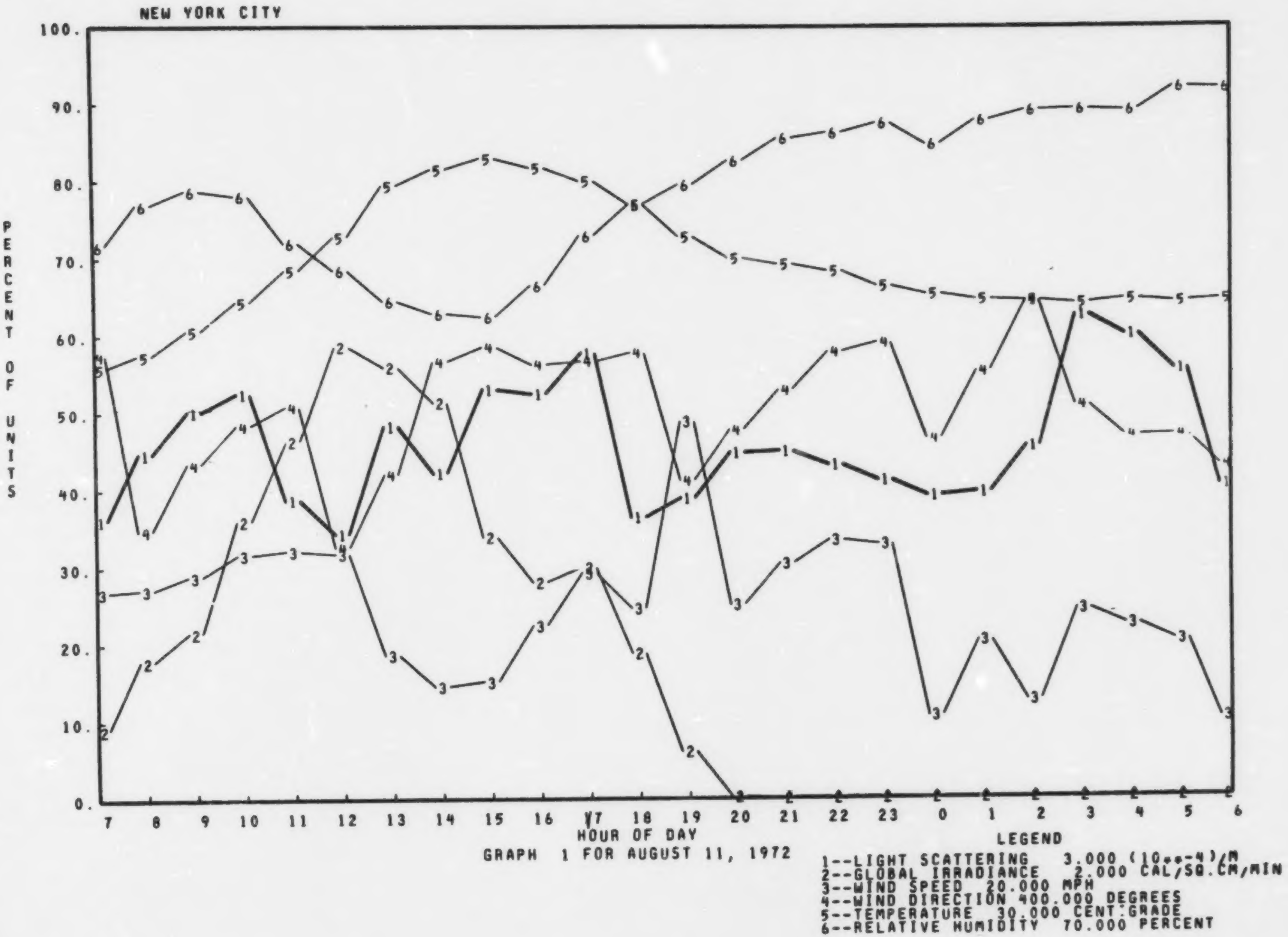
11--LIGHT SCATTERING ((10**-4)/M)             1.097          1
12--SULFUR DIOXIDE (PPM)                      0.024          1
13--OZONE (PPM)                               0.037         16
14--NITRIC OXIDE (PPM)                        0.082         23
15--NITROGEN DIOXIDE (PPM)                    0.026         20
16--NITROGEN OXIDES (PPM)                     0.111         23
17--CARBON MONOXIDE (PPM)                     1.270          9
20--ETHYLENE (PPM)                            0.018         20
21--ACETYLENE (PPM)                           0.012         21
30--NON-METHANE HYDROCARBON (PPM)             2.540          0
```

```
        SUBSTANCE                           AVERAGE FOR AUGUST 11, 1972

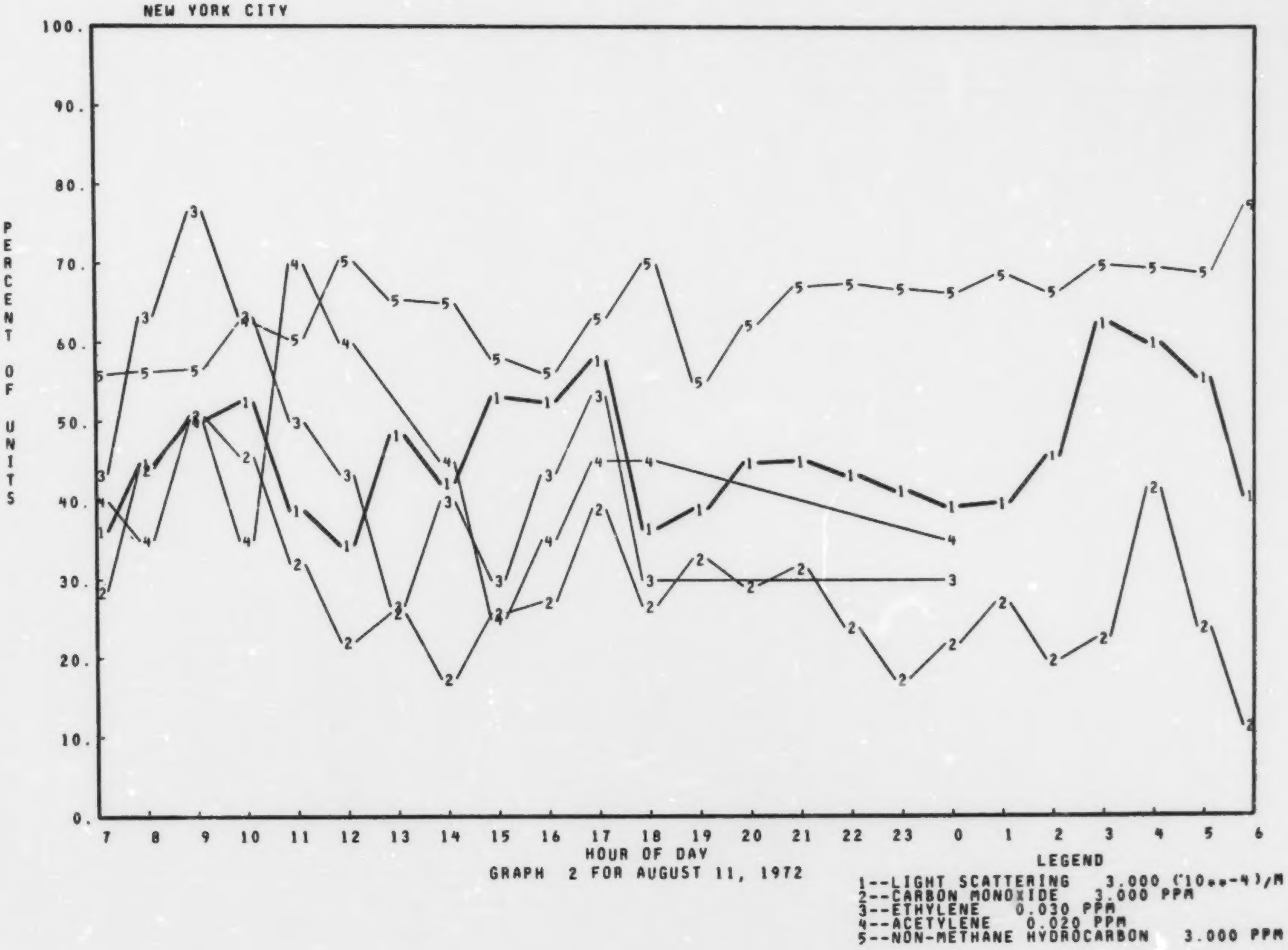
 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)
 7--WIND SPEED (MPH)                                  0.345
 8--WIND DIRECTION (DEGREES)                          4.967
 9--TEMPERATURE (CENTIGRADE)                        201.317
10--RELATIVE HUMIDITY (PERCENT)                      20.764
11--LIGHT SCATTERING ((10**-4)/M)                    55.369
12--SULFUR DIOXIDE (PPM)                              1.379
13--OZONE (PPM)                                       0.022
14--NITRIC OXIDE (PPM)                                0.042
15--NITROGEN DIOXIDE (PPM)                            0.026
16--NITROGEN OXIDES (PPM)                             0.022
17--CARBON MONOXIDE (PPM)                             0.052
18--METHANE (PPM)                                     0.860
19--TOTAL HYDROCARBON (PPM)                           1.569
20--ETHYLENE (PPM)                                    3.500
21--ACETYLENE (PPM)                                   0.014
30--NON-METHANE HYDROCARBON (PPM)                     0.009
                                                      1.932


        SUBSTANCE                          MAX CONCENTRATION  HOUR  FOR AUGUST 11, 1972

11--LIGHT SCATTERING ((10**-4)/M)
12--SULFUR DIOXIDE (PPM)                          1.877         3
13--OZONE (PPM)                                   0.040         3
14--NITRIC OXIDE (PPM)                            0.117        17
15--NITROGEN DIOXIDE (PPM)                        0.097         7
16--NITROGEN OXIDES (PPM)                         0.033        16
17--CARBON MONOXIDE (PPM)                         0.131         7
20--ETHYLENE (PPM)                                1.523         9
21--ACETYLENE (PPM)                               0.023         9
30--NON-METHANE HYDROCARBON (PPM)                 0.014        11
                                                  2.320         6
```

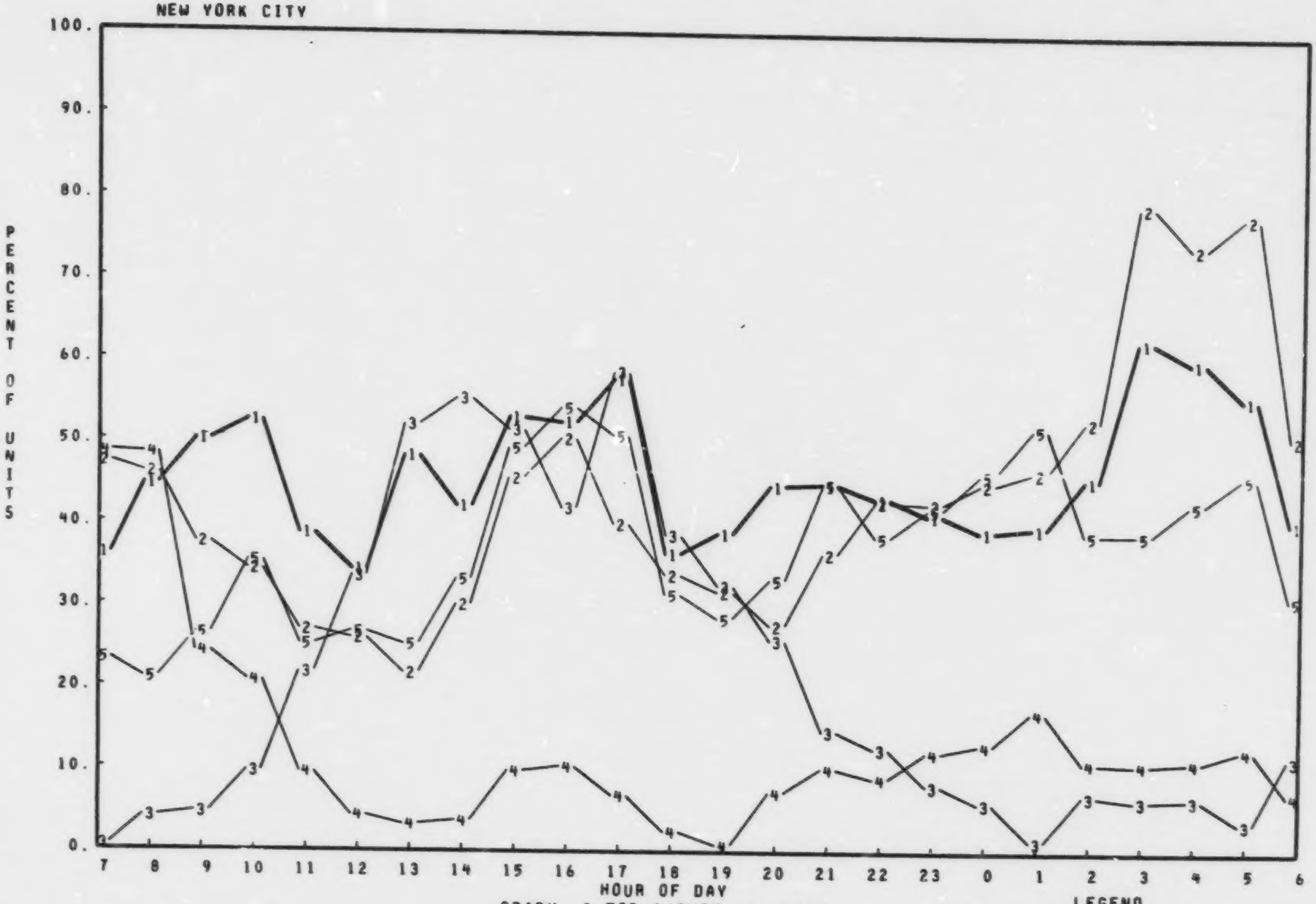


GRAPH 1 FOR AUGUST 11, 1972



GRAPH 2 FOR AUGUST 11, 1972

NEW YORK CITY



GRAPH 3 FOR AUGUST 11, 1972

LEGEND
1--LIGHT SCATTERING 3.000 (10**-4)/M
2--SULFUR DIOXIDE 0.050 PPM
3--OZONE 0.200 PPM
4--NITRIC OXIDE 0.200 PPM
5--NITROGEN DIOXIDE 0.060 PPM

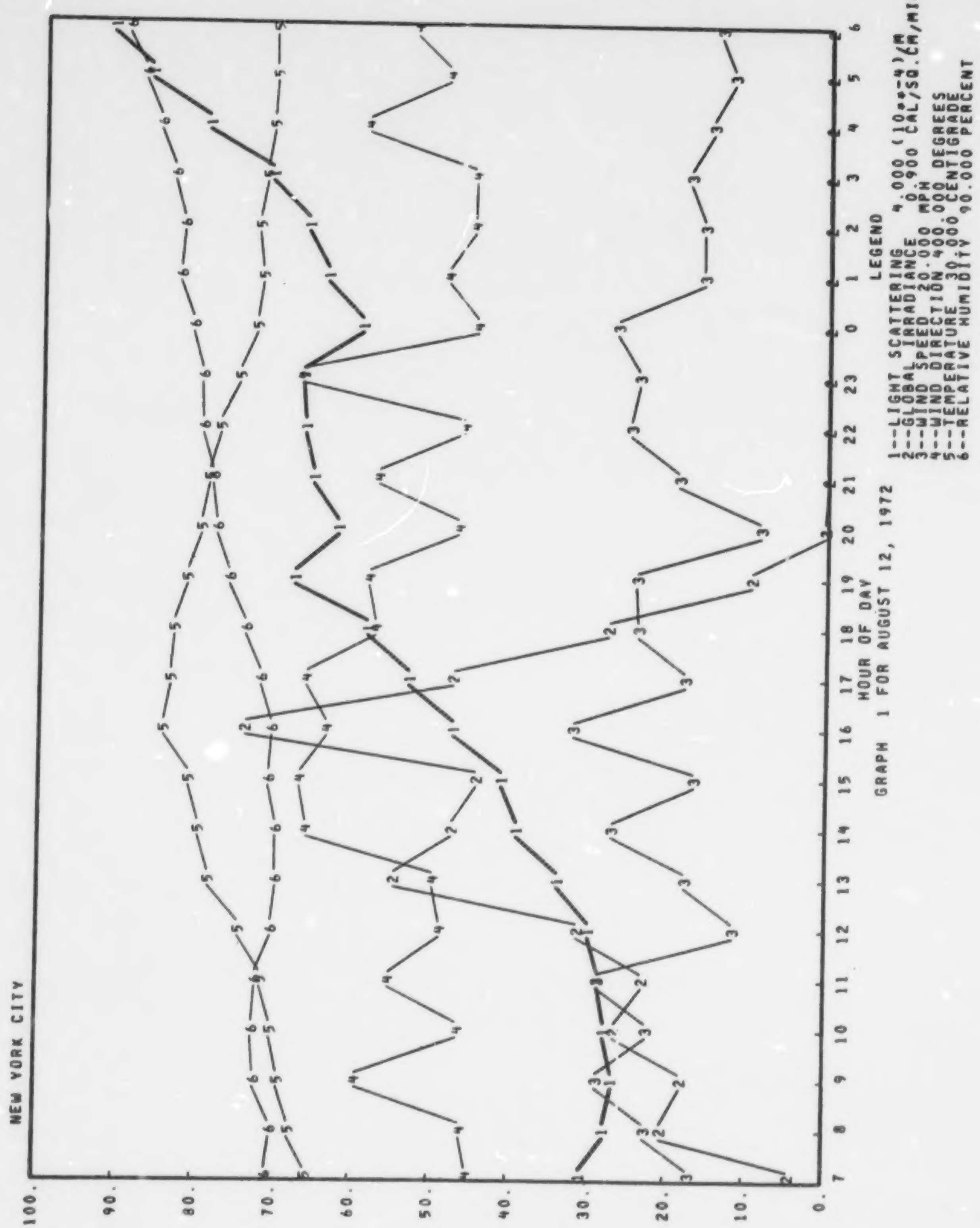
```
          SUBSTANCE                       AVERAGE FOR AUGUST 12, 1972

 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                0.161
 7--WIND SPEED (MPH)                                 4.055
 8--WIND DIRECTION (DEGREES)                       215.035
 9--TEMPERATURE (CENTIGRADE)                        22.544
10--RELATIVE HUMIDITY (PERCENT)                     68.970
11--LIGHT SCATTERING ((10**-4)/M)                    2.156
12--SULFUR DIOXIDE (PPM)                             0.021
13--OZONE (PPM)                                      0.029
14--NITRIC OXIDE (PPM)                               0.023
15--NITROGEN DIOXIDE (PPM)                           0.024
16--NITROGEN OXIDES (PPM)                            0.051
17--CARBON MONOXIDE (PPM)                            0.676
18--METHANE (PPM)                                    1.578
19--TOTAL HYDROCARBON (PPM)                          3.386
20--ETHYLENE (PPM)                                   0.004
21--ACETYLENE (PPM)                                  0.003
30--NON-METHANE HYDROCARBON (PPM)                    1.808

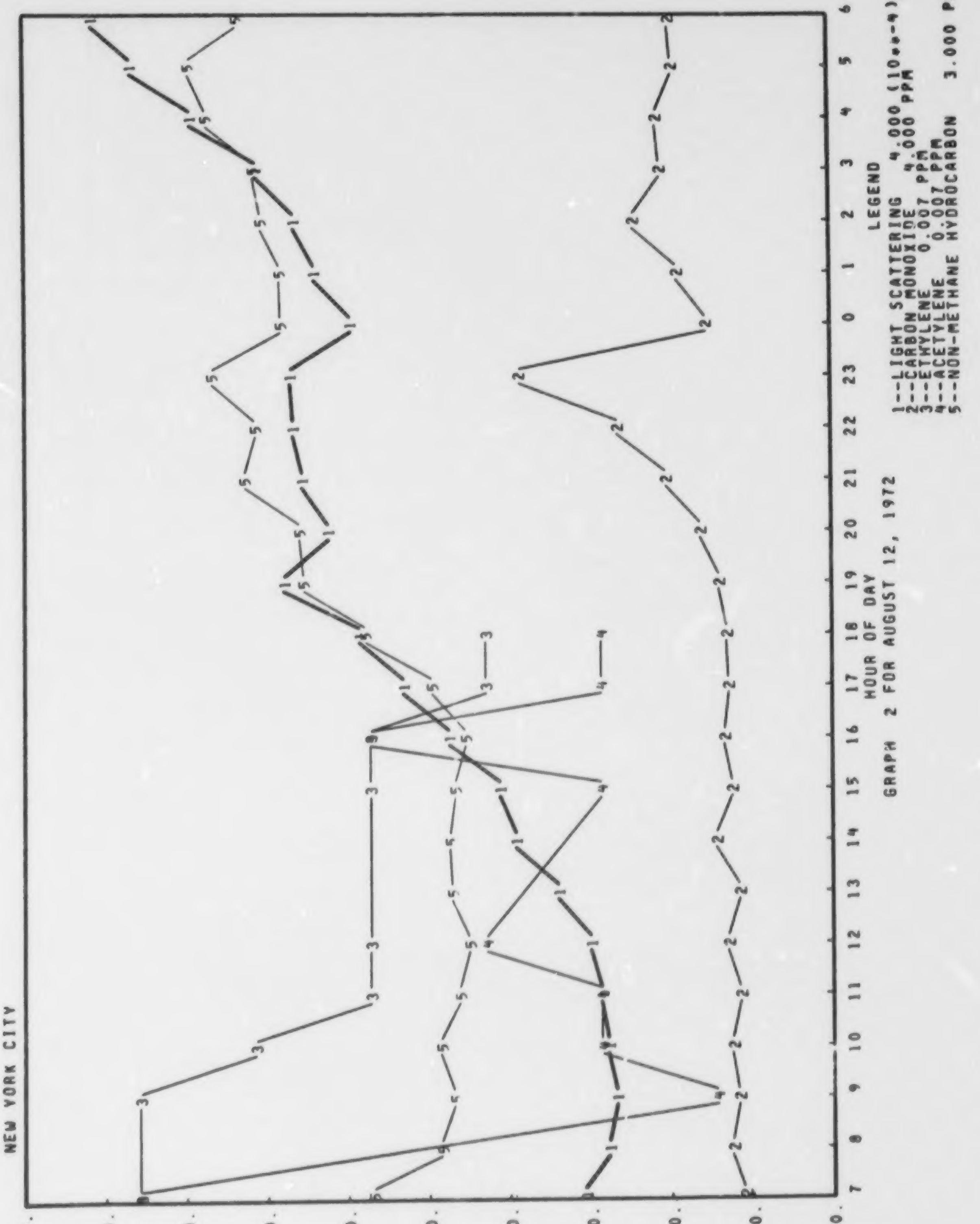


          SUBSTANCE                       MAX CONCENTRATION  HOUR  FOR AUGUST 12, 1972


11--LIGHT SCATTERING ((10**-4)/M)               3.660         6
12--SULFUR DIOXIDE (PPM)                        0.038         3
13--OZONE (PPM)                                 0.078        18
14--NITRIC OXIDE (PPM)                          0.041        23
15--NITROGEN DIOXIDE (PPM)                      0.033        23
16--NITROGEN OXIDES (PPM)                       0.080        23
17--CARBON MONOXIDE (PPM)                       1.547        23
20--ETHYLENE (PPM)                              0.006         7
                                                              9
21--ACETYLENE (PPM)                             0.006         7
30--NON-METHANE HYDROCARBON (PPM)               2.383         5
```



GRAPH 1 FOR AUGUST 12, 1972



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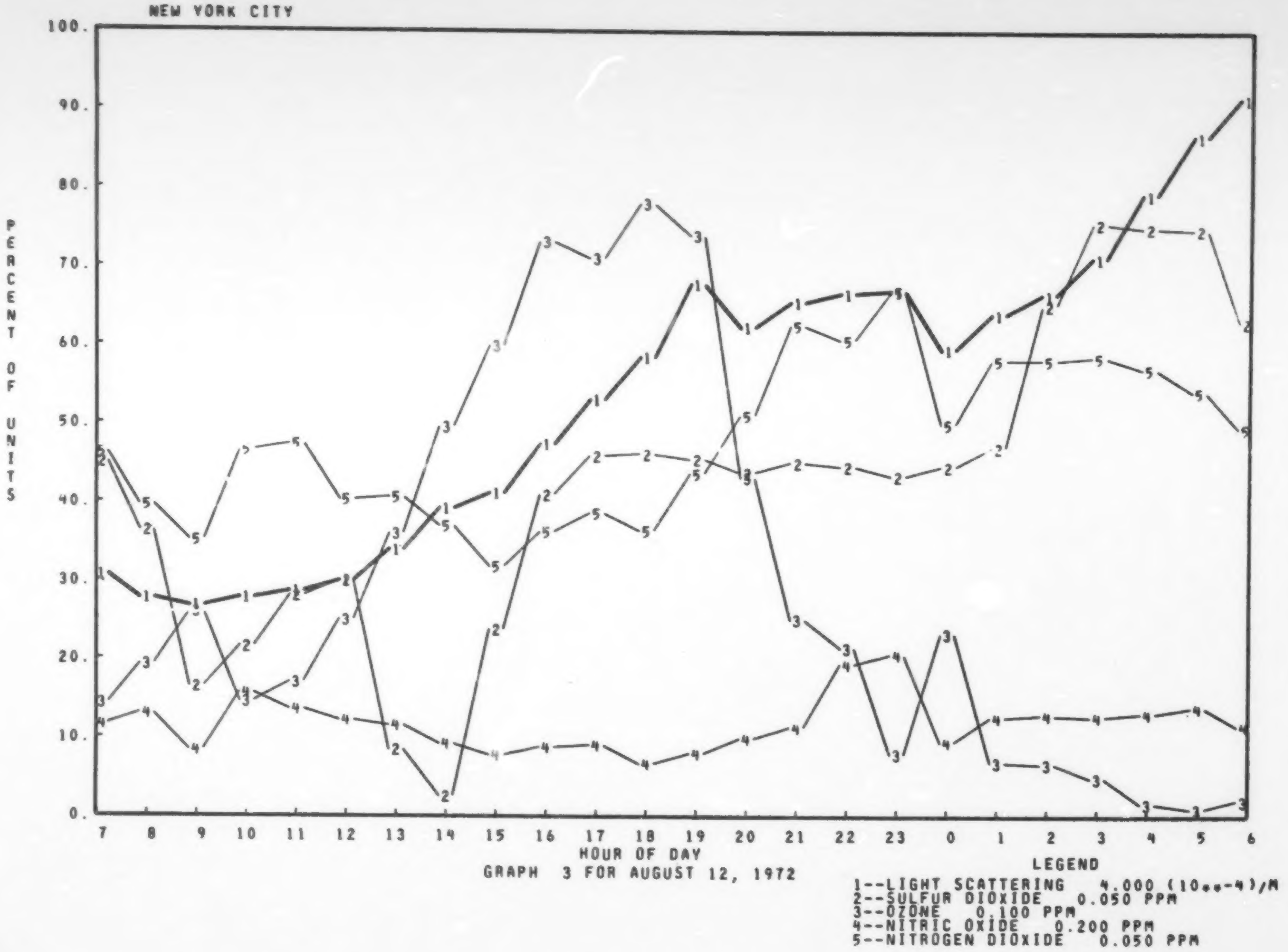

GRAPH 3 FOR AUGUST 12, 1972

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          SUBSTANCE                          AVERAGE FOR AUGUST 13, 1972

  6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)              0.278
  7--WIND SPEED (MPH)                               3.386
  8--WIND DIRECTION (DEGREES)                     220.261
  9--TEMPERATURE (CENTIGRADE)                      25.548
 10--RELATIVE HUMIDITY (PERCENT)                   67.100
 11--LIGHT SCATTERING ((10**-4)/M)                  4.240
 12--SULFUR DIOXIDE (PPM)                           0.026
 13--OZONE (PPM)                                    0.060
 14--NITRIC OXIDE (PPM)                             0.020
 15--NITROGEN DIOXIDE (PPM)                         0.027
 16--NITROGEN OXIDES (PPM)                          0.052
 17--CARBON MONOXIDE (PPM)                          1.196
 18--METHANE (PPM)                                  1.767
 19--TOTAL HYDROCARBON (PPM)                        3.764
 20--ETHYLENE (PPM)                                 0.005
 21--ACETYLENE (PPM)                                0.002
 30--NON-METHANE HYDROCARBON (PPM)                  1.996


          SUBSTANCE                          MAX CONCENTRATION  HOUR  FOR AUGUST 13, 1972

 11--LIGHT SCATTERING ((10**-4)/M)               6.503          1
 12--SULFUR DIOXIDE (PPM)                        0.034          8
 13--OZONE (PPM)                                 0.158         15
 14--NITRIC OXIDE (PPM)                          0.035         22
 15--NITROGEN DIOXIDE (PPM)                      0.050         22
 16--NITROGEN OXIDES (PPM)                       0.092         22
 17--CARBON MONOXIDE (PPM)                       2.040          0
 20--ETHYLENE (PPM)                              0.008         11
 21--ACETYLENE (PPM)                             0.004         20
 30--NON-METHANE HYDROCARBON (PPM)               2.813         23
```
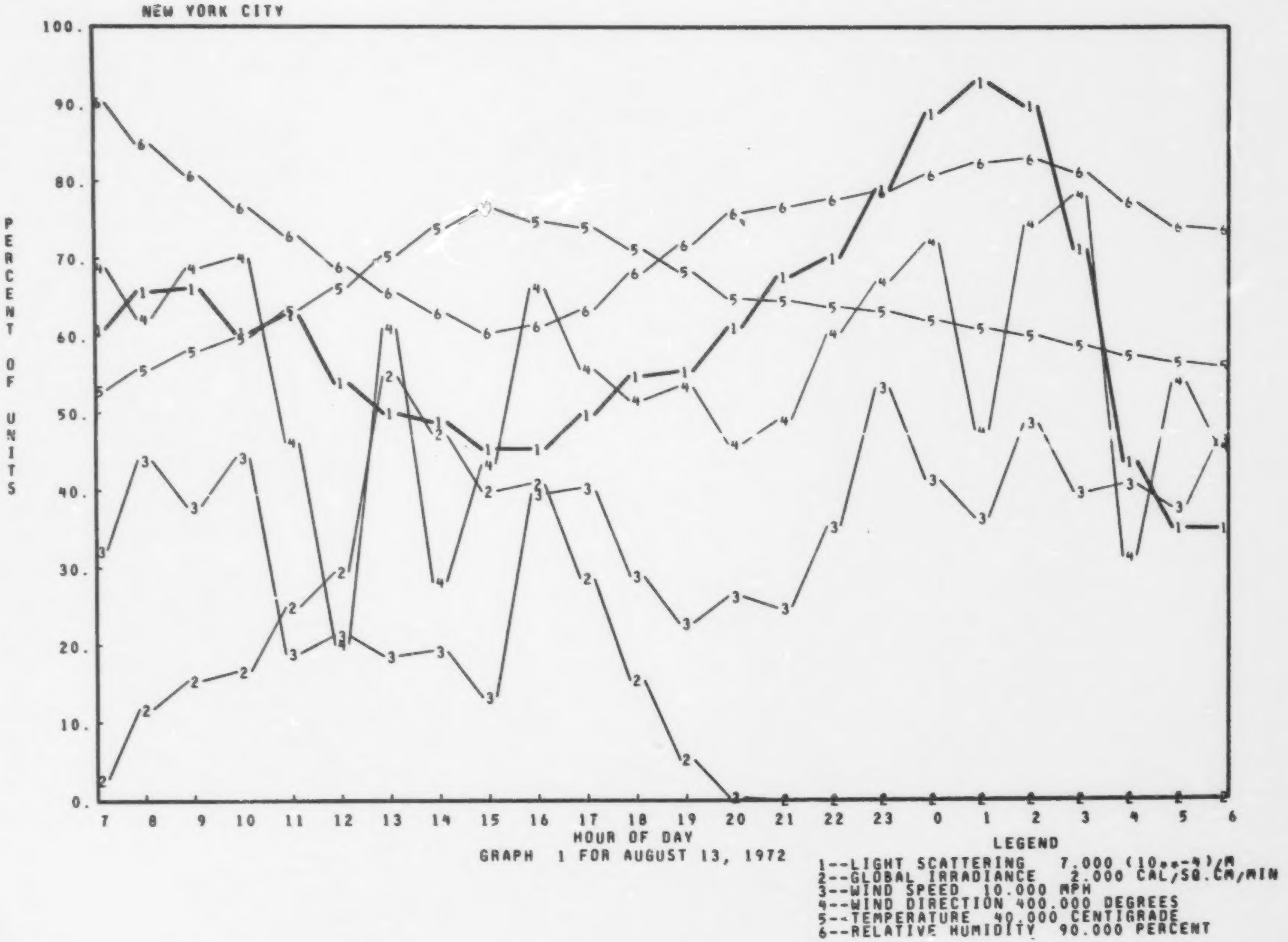
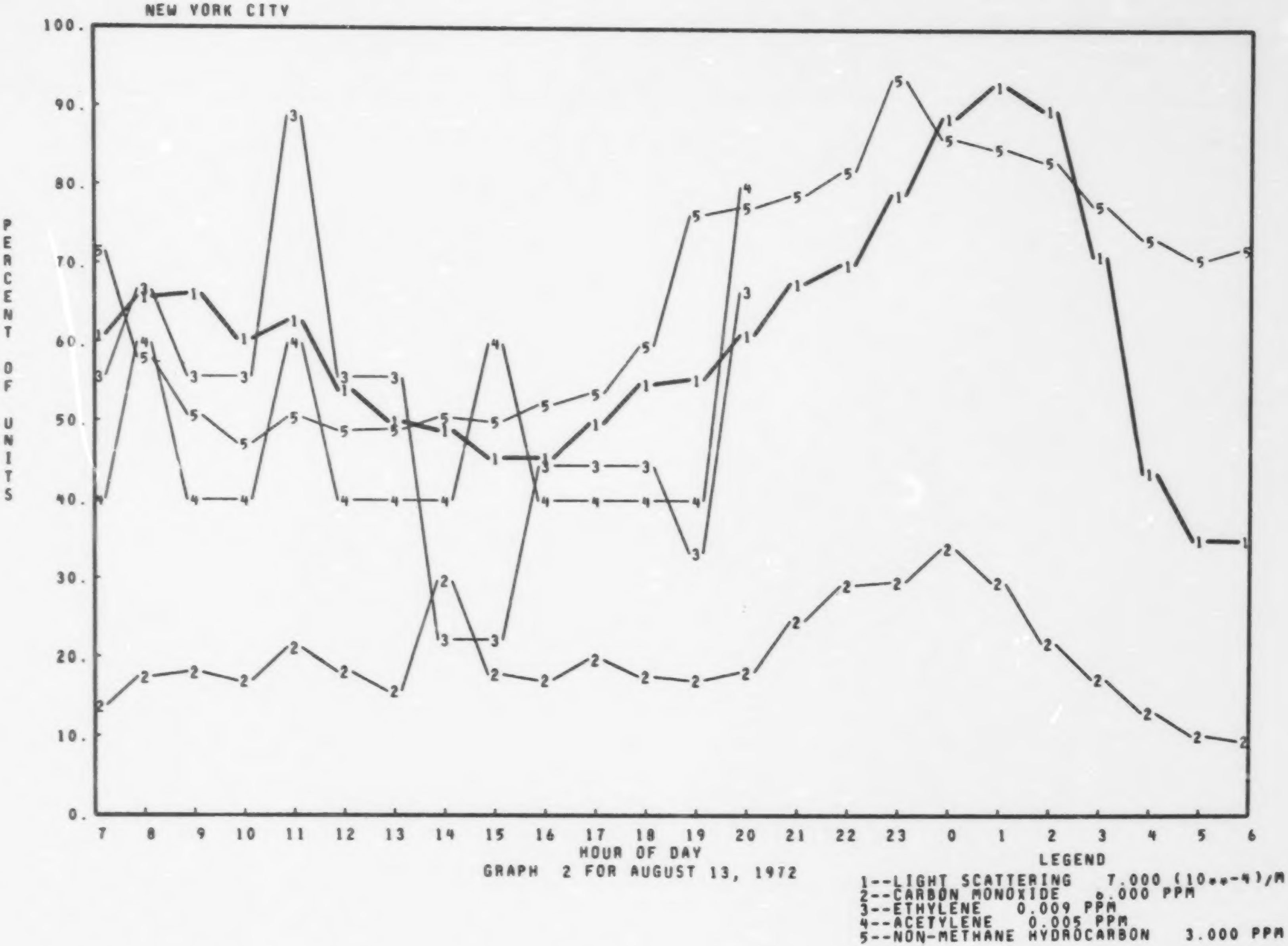



GRAPH 1 FOR AUGUST 13, 1972



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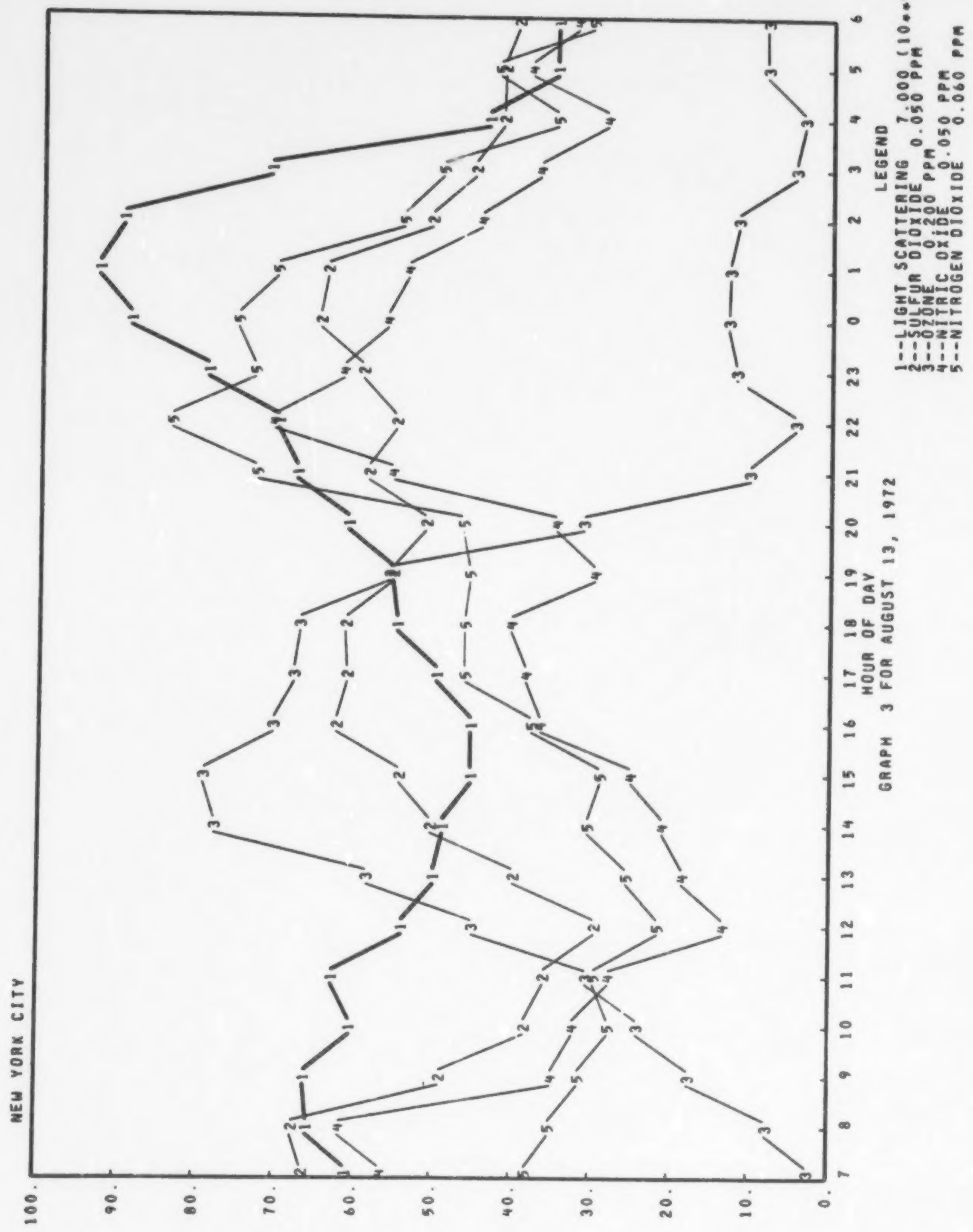
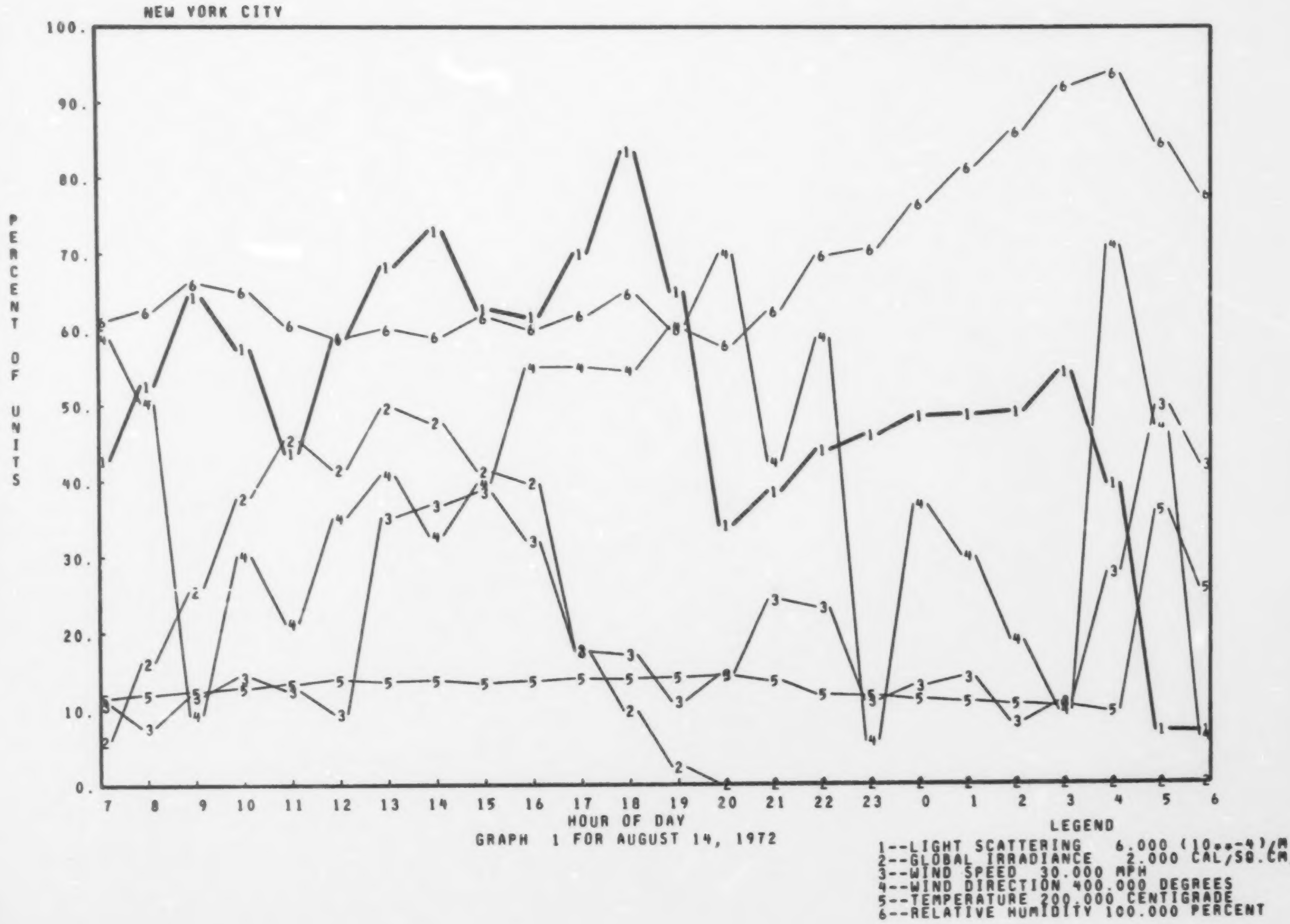


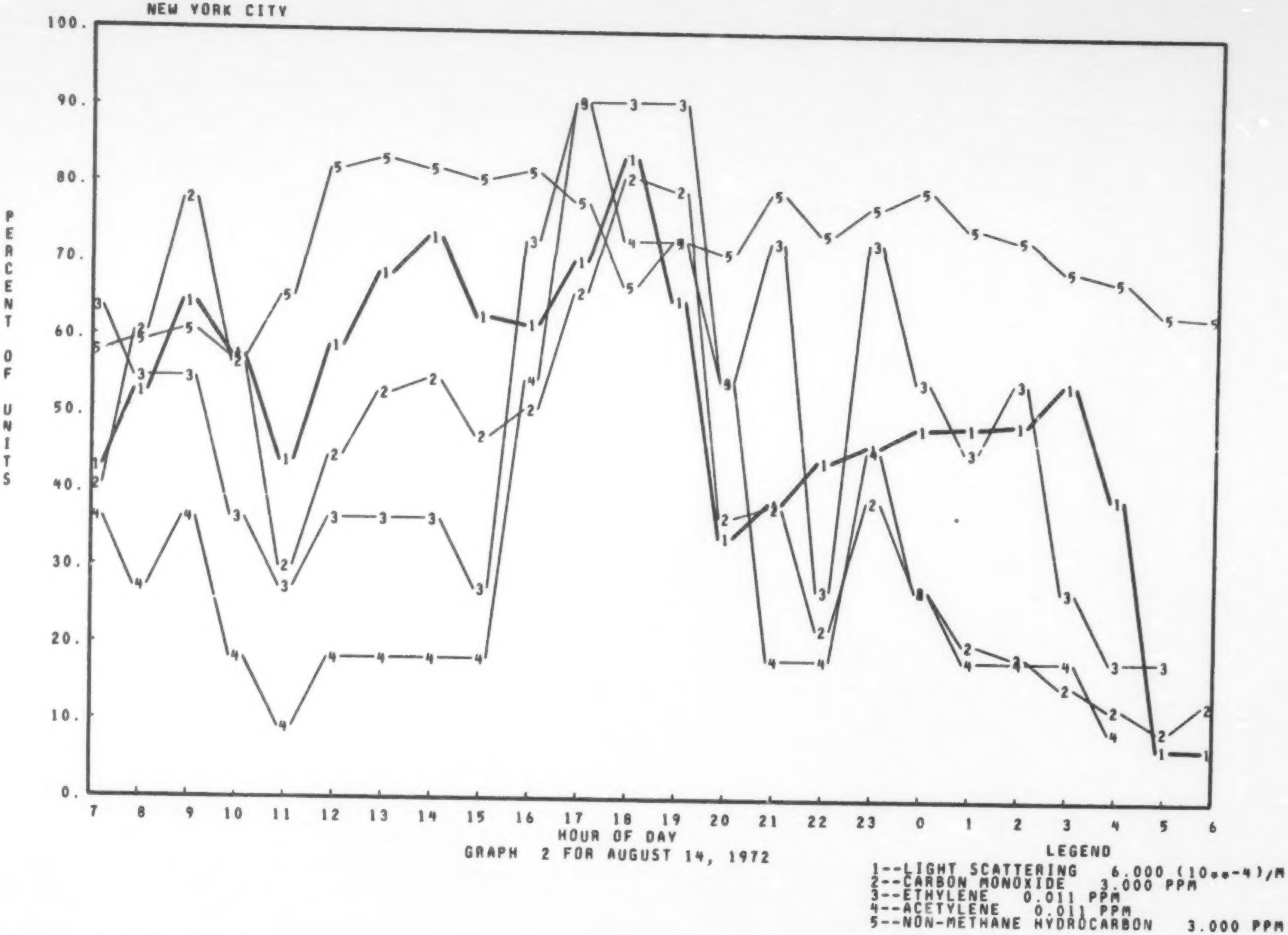
GRAPH 3 FOR AUGUST 13, 1972

| SUBSTANCE | AVERAGE FOR AUGUST 14, 1972 |
|---|---|
| 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN) | 0.318 |
| 7--WIND SPEED (MPH) | 6.181 |
| 8--WIND DIRECTION (DEGREES) | 156.895 |
| 9--TEMPERATURE (CENTIGRADE) | 28.209 |
| 10--RELATIVE HUMIDITY (PERCENT) | 68.987 |
| 11--LIGHT SCATTERING ((10**-4)/M) | 3.055 |
| 12--SULFUR DIOXIDE (PPM) | 0.020 |
| 13--OZONE (PPM) | 0.061 |
| 14--NITRIC OXIDE (PPM) | 0.030 |
| 15--NITROGEN DIOXIDE (PPM) | 0.028 |
| 16--NITROGEN OXIDES (PPM) | 0.064 |
| 17--CARBON MONOXIDE (PPM) | 1.241 |
| 18--METHANE (PPM) | 1.604 |
| 19--TOTAL HYDROCARBON (PPM) | 3.754 |
| 20--ETHYLENE (PPM) | 0.006 |
| 21--ACETYLENE (PPM) | 0.004 |
| 30--NON-METHANE HYDROCARBON (PPM) | 2.150 |

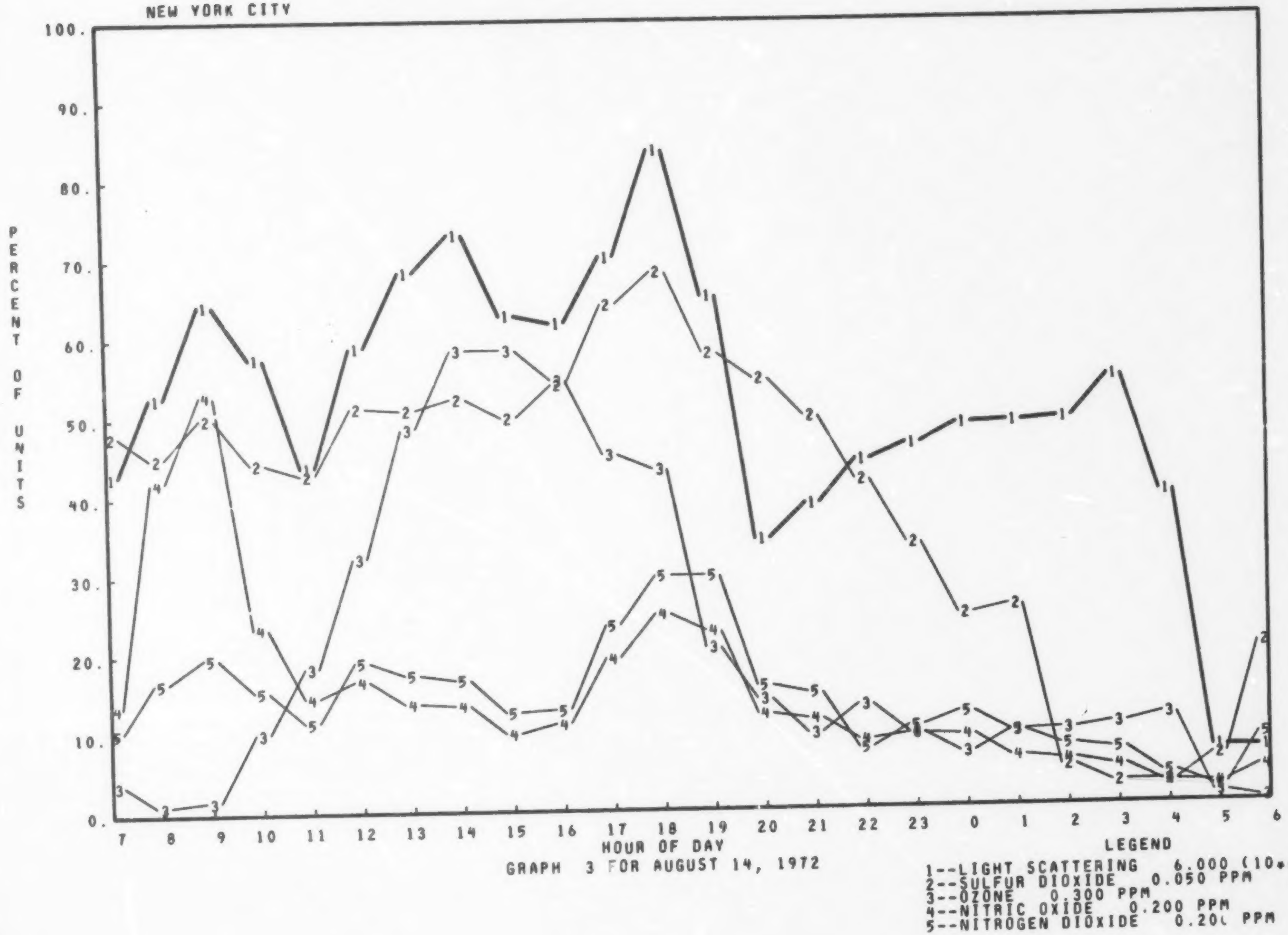
| SUBSTANCE | MAX CONCENTRATION | HOUR | FOR AUGUST 14, 1972 |
|---|---|---|---|
| 11--LIGHT SCATTERING ((10**-4)/M) | 5.020 | 18 | |
| 12--SULFUR DIOXIDE (PPM) | 0.034 | 18 | |
| 13--OZONE (PPM) | 0.175 | 14 | |
| 14--NITRIC OXIDE (PPM) | 0.106 | 9 | |
| 15--NITROGEN DIOXIDE (PPM) | 0.059 | 19 | |
| 16--NITROGEN OXIDES (PPM) | 0.153 | 9 | |
| 17--CARBON MONOXIDE (PPM) | 2.430 | 18 | |
| 20--ETHYLENE (PPM) | 0.010 | 17 | |
| | | 18 | |
| | | 19 | |
| 21--ACETYLENE (PPM) | 0.010 | 17 | |
| 30--NON-METHANE HYDROCARBON (PPM) | 2.497 | 13 | |



GRAPH 1 FOR AUGUST 14, 1972



GRAPH 2 FOR AUGUST 14, 1972



GRAPH 3 FOR AUGUST 14, 1972

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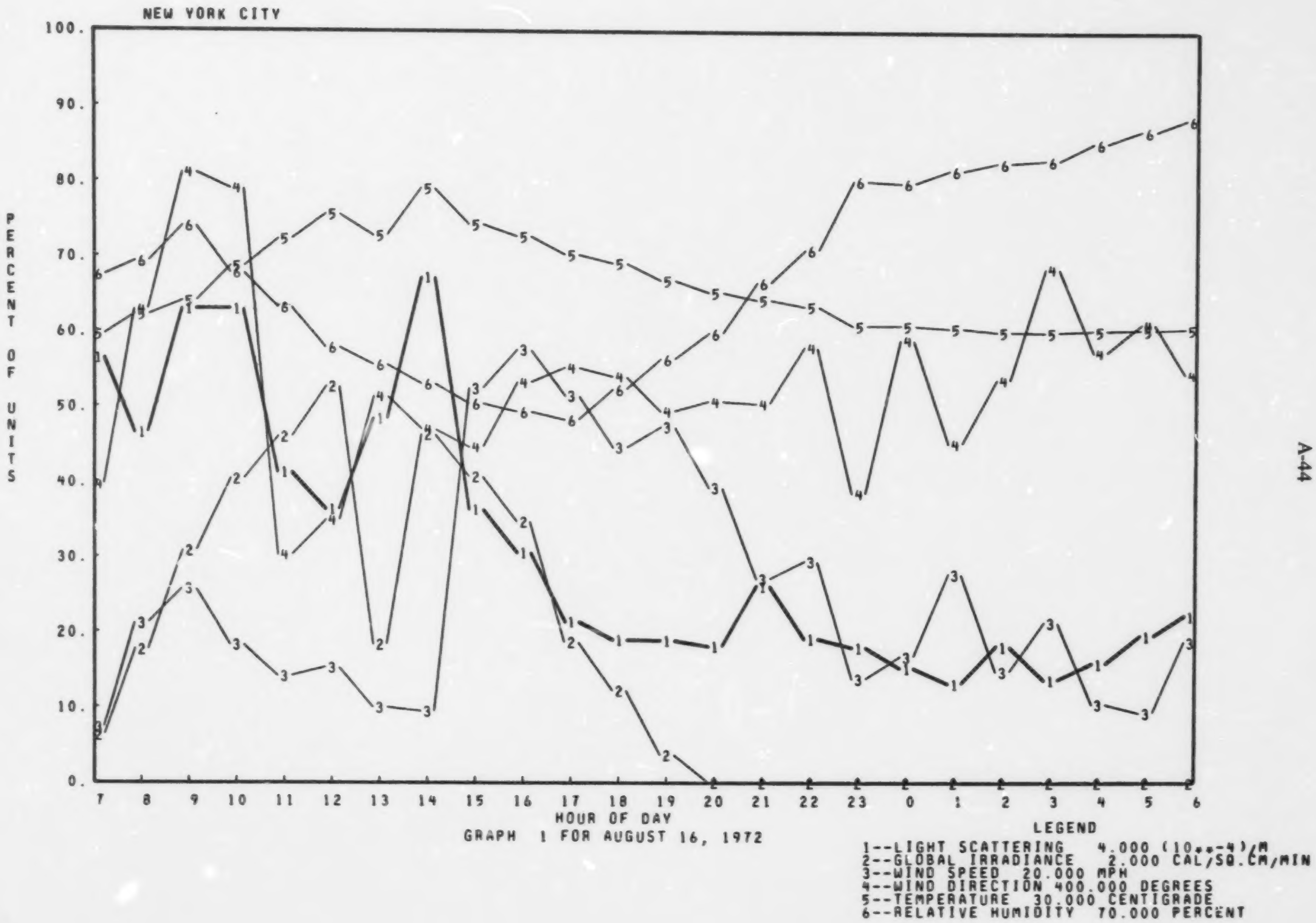
          SUBSTANCE                          AVERAGE FCR AUGUST 16, 1972


 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                  0.308
 7--WIND SPEED (MPH)                                   5.038
 8--WIND DIRECTION (DEGREES)                         213.358
 9--TEMPERATURE (CENTIGRADE)                          19.804
10--RELATIVE HUMIDITY (PERCENT)                       47.563
11--LIGHT SCATTERING ((10**-4)/M)                      1.249
12--SULFUR DICXIDE (PPM)                               0.019
13--OZCNE (PPM)                                        0.023
14--NITRIC OXICE (PPM)                                 0.038
15--NITROGEN CIOXICE (PPM)                             0.023
16--NITROGEN OXIDES (PPM)                              0.068
17--CARBON MONCXIDE (PPM)                              0.830
18--METHANE (PPM)                                      1.620
19--TOTAL HYDROCARBON (PPM)                            3.888
20--ETHYLENE (PPM)                                     0.007
21--ACETYLENE (PPM)                                    0.003
30--NON-METHANE HYDROCARBON (PPM)                      2.268

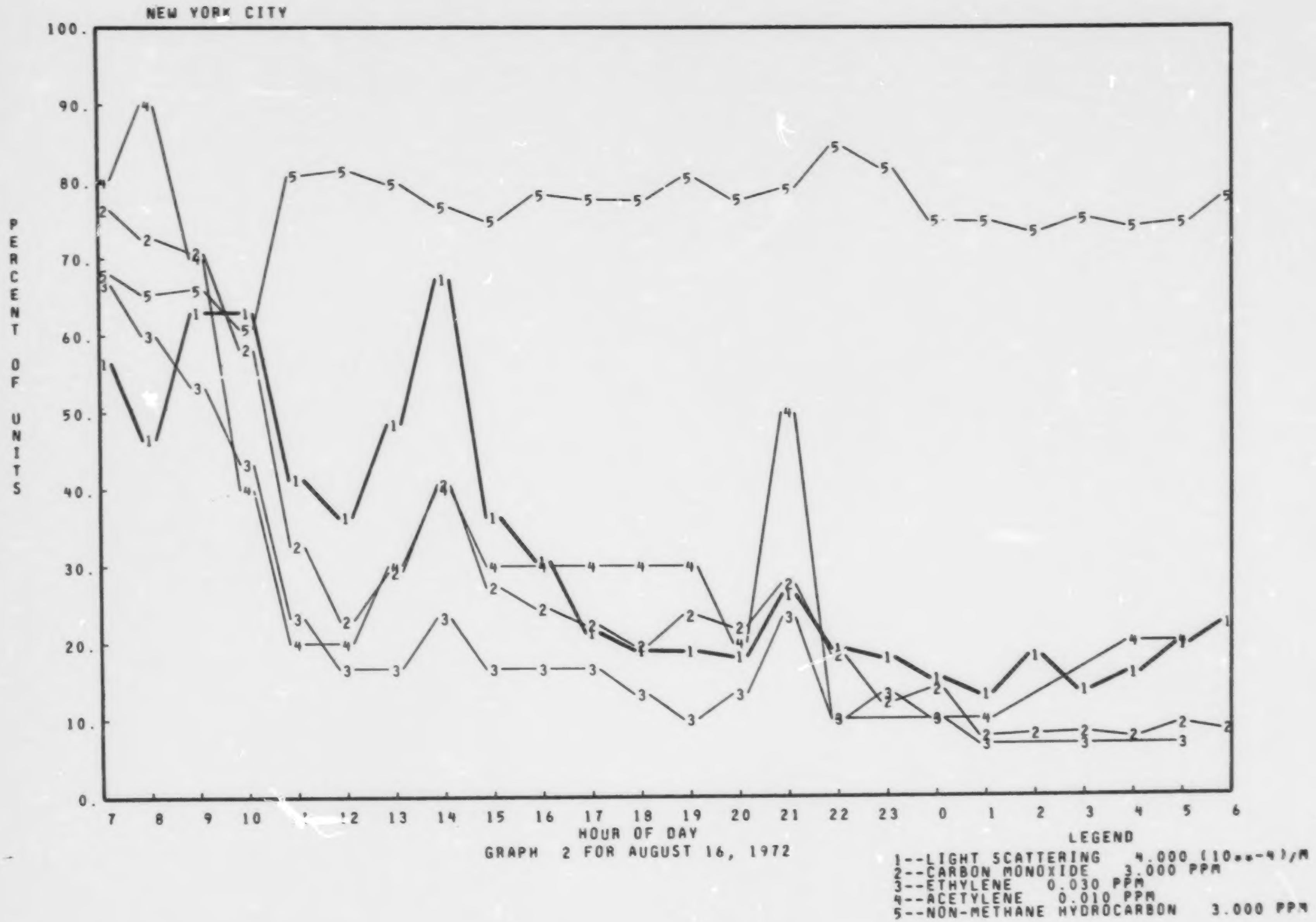


          SUBSTANCE                          MAX CONCENTRATION  HOUR  FOR AUGUST 16, 1972

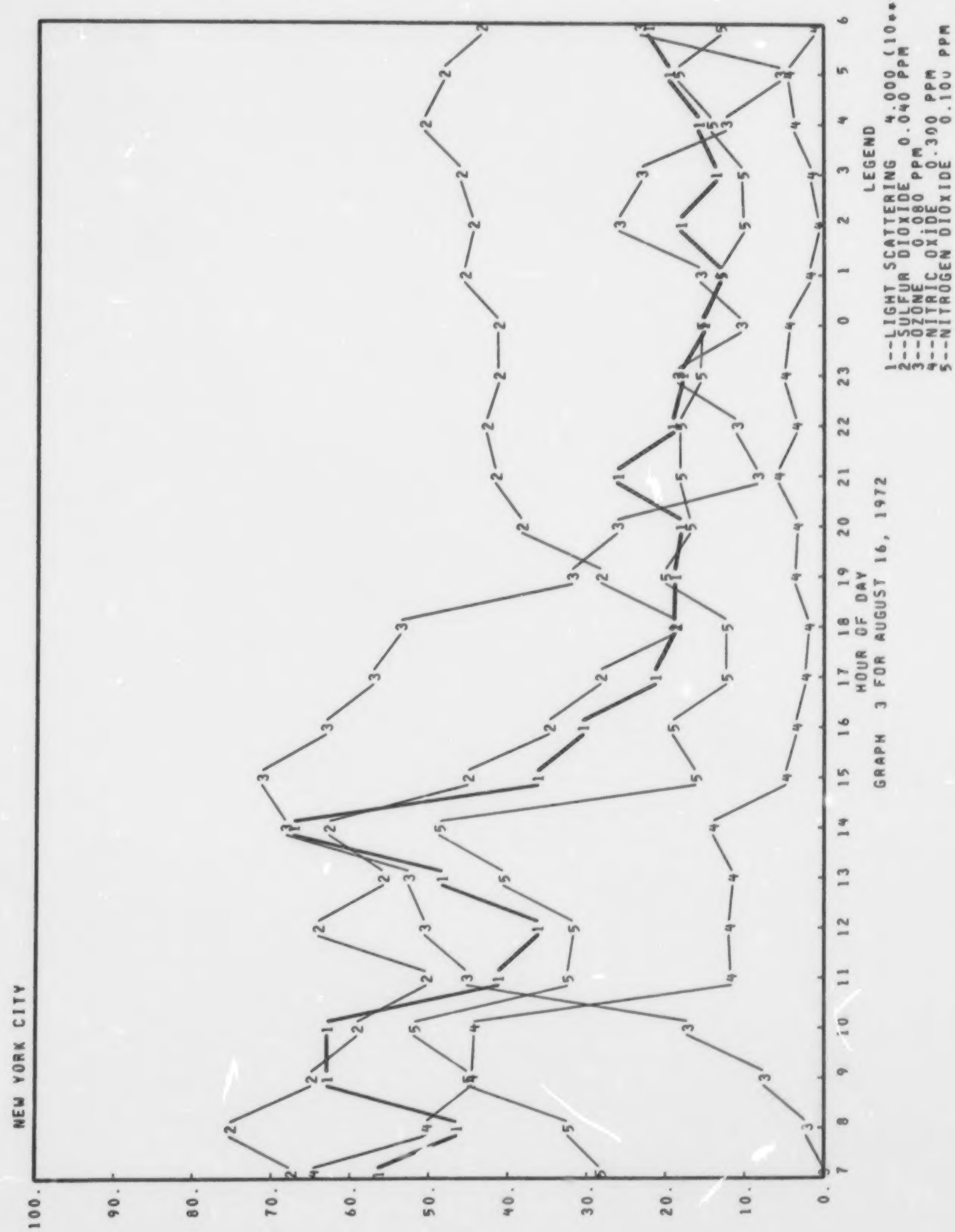

11--LIGHT SCATTERING ((10**-4)/M)                   2.693        14
12--SULFUR DICXIDE (PPM)                            0.030         8
13--OZCNE (PPM)                                     0.057        15
14--NITRIC OXICE (PPM)                              0.194         7
15--NITROGEN CIOXICE (PPM)                          0.052        10
16--NITROGEN OXIDES (PPM)                           0.233         7
17--CARBON MONCXIDE (PPM)                           2.292         7
20--ETHYLENE (PPM)                                  0.020         7
21--ACETYLENE (PPM)                                 0.009         8
30--NON-METHANE HYDROCARBON (PPM)                   2.533        22
```



GRAPH 1 FOR AUGUST 16, 1972



GRAPH 2 FOR AUGUST 16, 1972



GRAPH 3 FOR AUGUST 16, 1972

```
          SUBSTANCE                          AVERAGE FOR AUGUST 17, 1972

  6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                  0.078
  7--WIND SPEED (MPH)                                   6.527
  8--WIND DIRECTION (DEGREES)                         184.985
  9--TEMPERATURE (CENTIGRADE)                          20.081
 10--RELATIVE HUMIDITY (PERCENT)                       69.614
 11--LIGHT SCATTERING ((10**-4)/M)                      1.148
 12--SULFUR DIOXIDE (PPM)                               0.014
 13--OZONE (PPM)                                        0.019
 14--NITRIC OXIDE (PPM)                                 0.017
 15--NITROGEN-DIOXIDE (PPM)                             0.016
 16--NITROGEN OXIDES (PPM)                              0.040
 17--CARBON MONOXIDE (PPM)                              0.750
 18--METHANE (PPM)                                      1.579
 19--TOTAL HYDROCARBON (PPM)                            3.588
 20--ETHYLENE (PPM)                                     0.007
 21--ACETYLENE (PPM)                                    0.003
 30--NON-METHANE HYDROCARBON (PPM)                      2.009


          SUBSTANCE                          MAX CONCENTRATION  HOUR  FOR AUGUST 17, 1972

 11--LIGHT SCATTERING ((10**-4)/M)                  1.826         9
 12--SULFUR DIOXIDE (PPM)                           0.029         5
 13--OZONE (PPM)                                    0.042        15
 14--NITRIC OXIDE (PPM)                             0.042         8
 15--NITROGEN DIOXIDE (PPM)                         0.025        21
 16--NITROGEN OXIDES (PPM)                          0.072         8
 17--CARBON MONOXIDE (PPM)                          1.440         9
 20--ETHYLENE (PPM)                                 0.018        21
 21--ACETYLENE (PPM)                                0.007        21
 30--NON-METHANE HYDROCARBON (PPM)                  2.633         7
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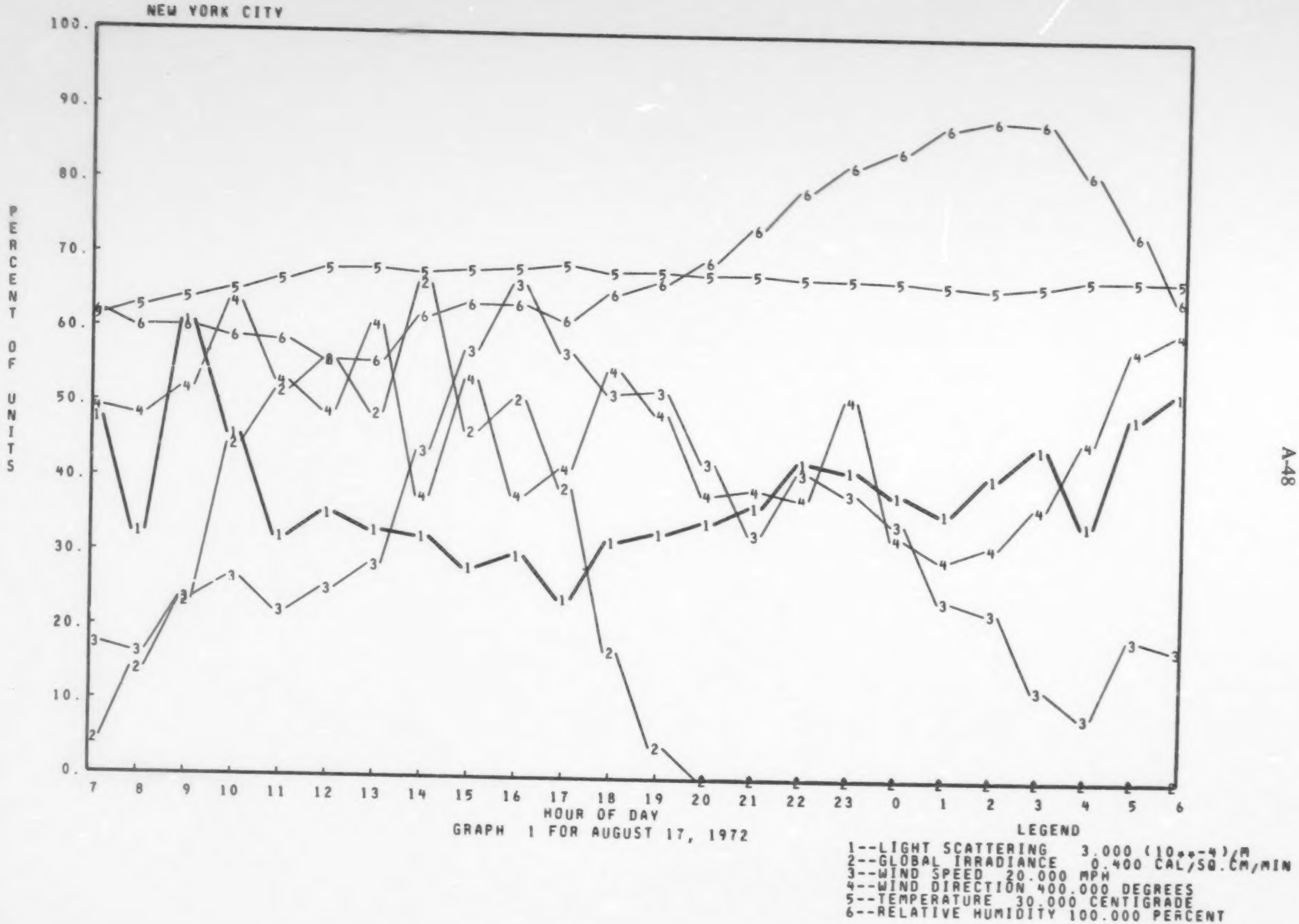
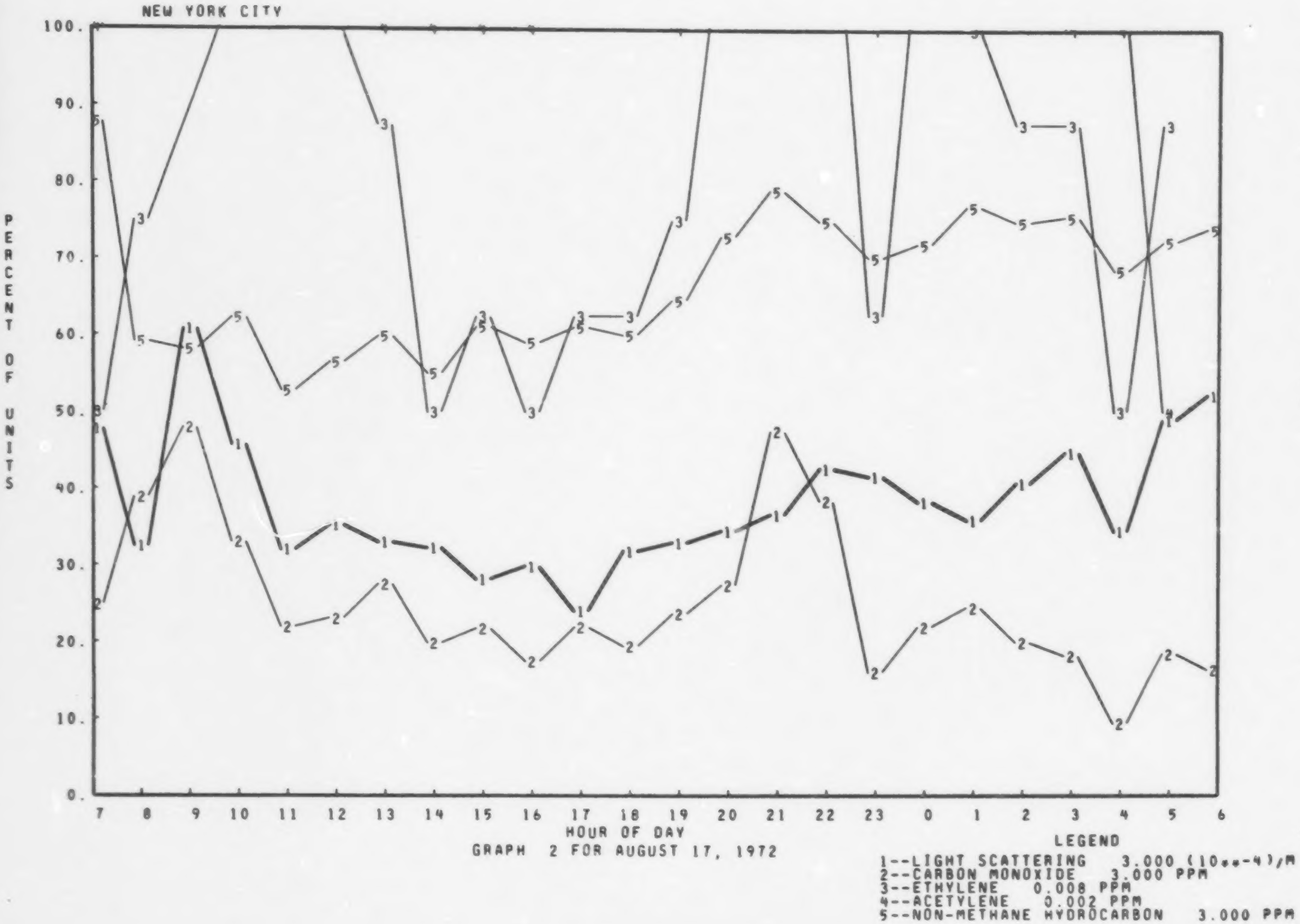


GRAPH 1 FOR AUGUST 17, 1972



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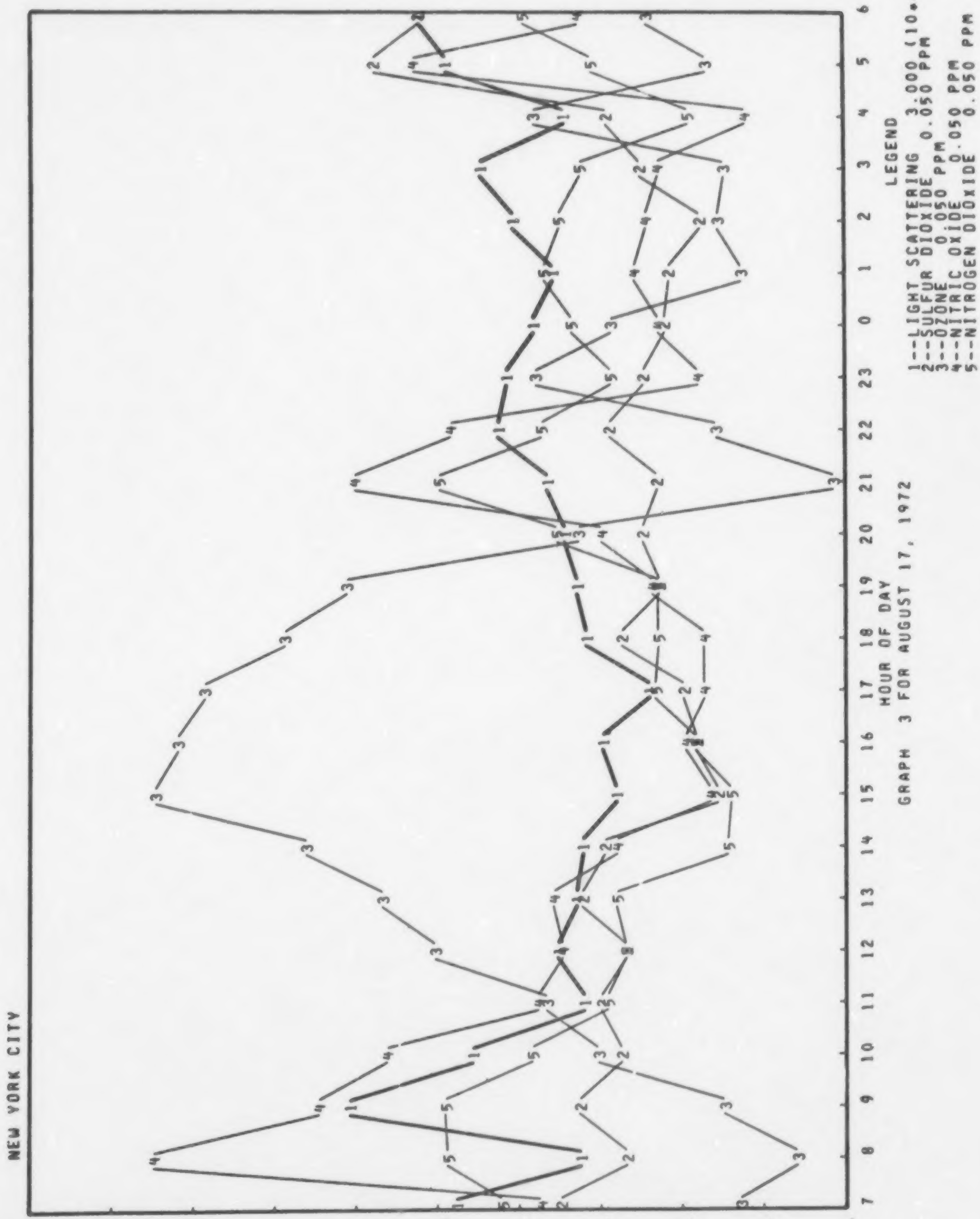
GRAPH 3 FOR AUGUST 17, 1972

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          SUBSTANCE                         AVERAGE FOR AUGUST 18, 1972


  6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                0.210
  7--WIND SPEED (MPH)                                 3.834
  8--WIND DIRECTION (DEGREES)                       208.987
  9--TEMPERATURE (CENTIGRADE)                        23.223
 10--RELATIVE HUMIDITY (PERCENT)                     70.478
 11--LIGHT SCATTERING ((10**-4)/M)                    4.307
 12--SULFUR DIOXIDE (PPM)                             0.031
 13--OZONE (PPM)                                      0.020
 14--NITRIC OXIDE (PPM)                               0.068
 15--NITROGEN DIOXIDE (PPM)                           0.044
 16--NITROGEN OXIDES (PPM)                            0.124
 17--CARBON MONOXIDE (PPM)                            2.121
 18--METHANE (PPM)                                    1.910
 19--TOTAL HYDROCARBON (PPM)                          4.544
 20--ETHYLENE (PPM)                                   0.014
 21--ACETYLENE (PPM)                                  0.008
 30--NON-METHANE HYDROCARBON (PPM)                    2.755



          SUBSTANCE                         MAX CONCENTRATION  HOUR  FOR AUGUST 18, 1972


 11--LIGHT SCATTERING ((10**-4)/M)                8.340         23
 12--SULFUR DIOXIDE (PPM)                         0.062         10
 13--OZONE (PPM)                                  0.076         18
 14--NITRIC OXIDE (PPM)                           0.160          1
 15--NITROGEN DIOXIDE (PPM)                       0.079          0
 16--NITROGEN OXIDES (PPM)                        0.255          1
 17--CARBON MONOXIDE (PPM)                        4.423         23
 20--ETHYLENE (PPM)                               0.030          0
 21--ACETYLENE (PPM)                              0.018          0
 30--NON-METHANE HYDROCARBON (PPM)                4.767         14
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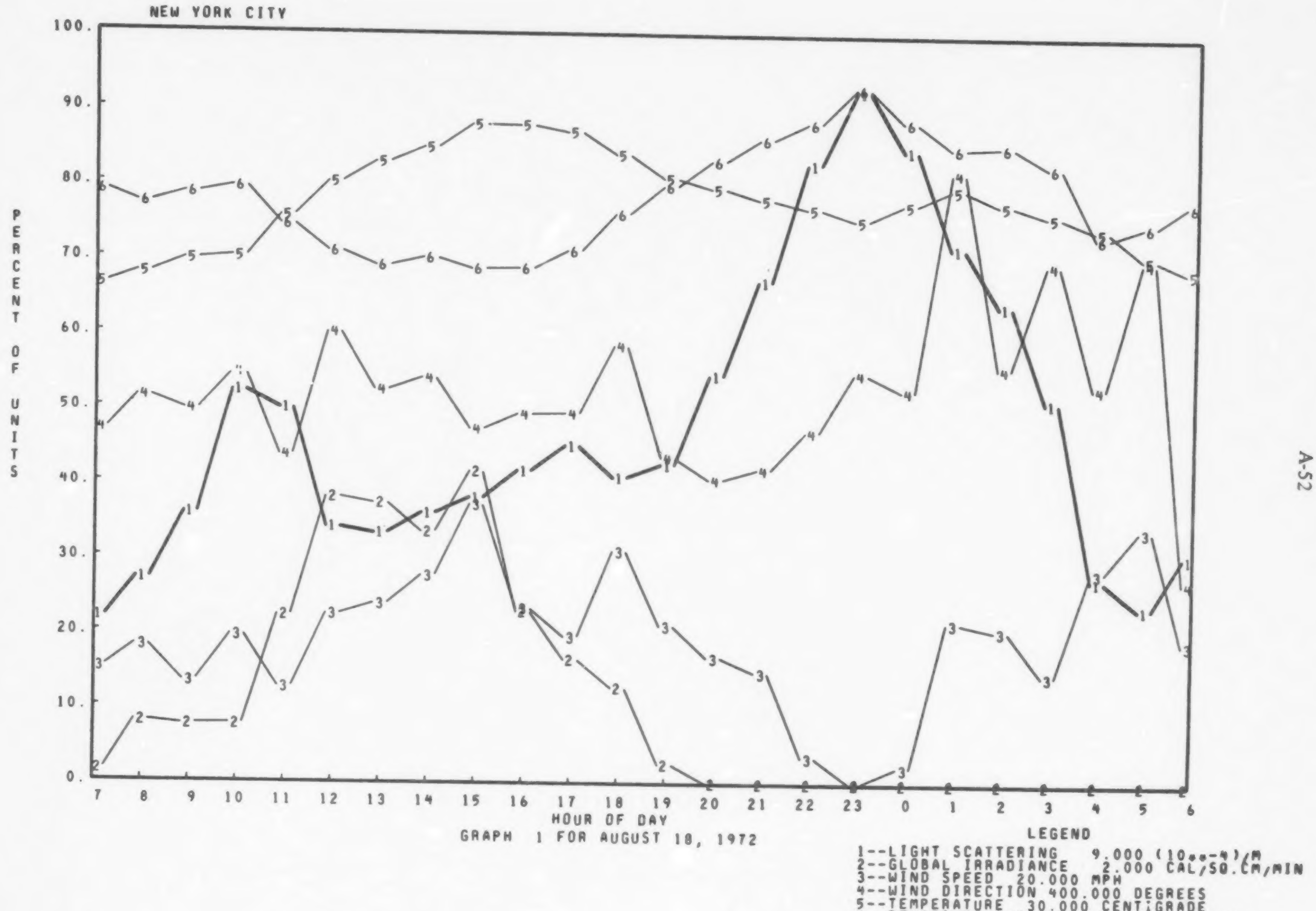

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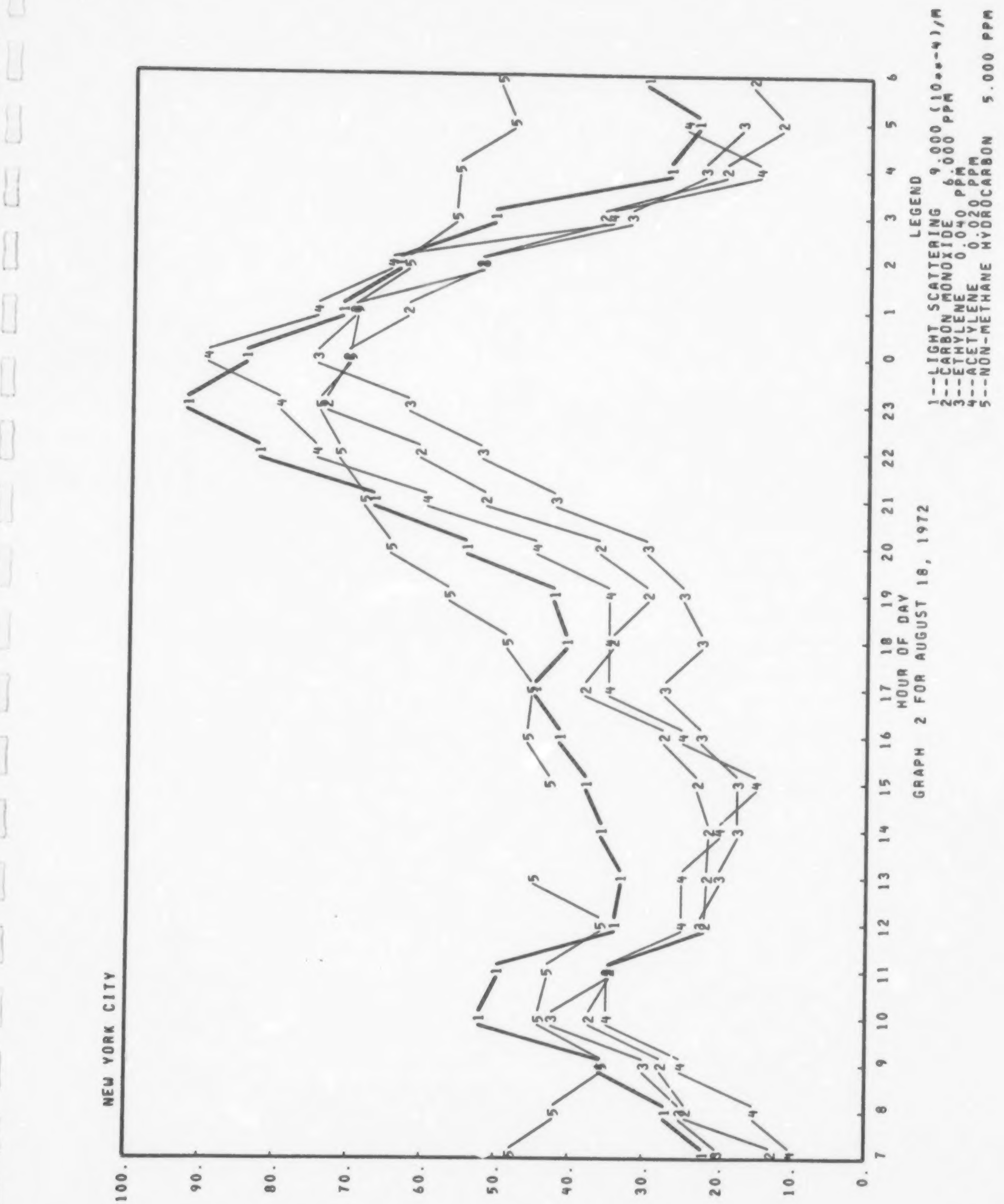

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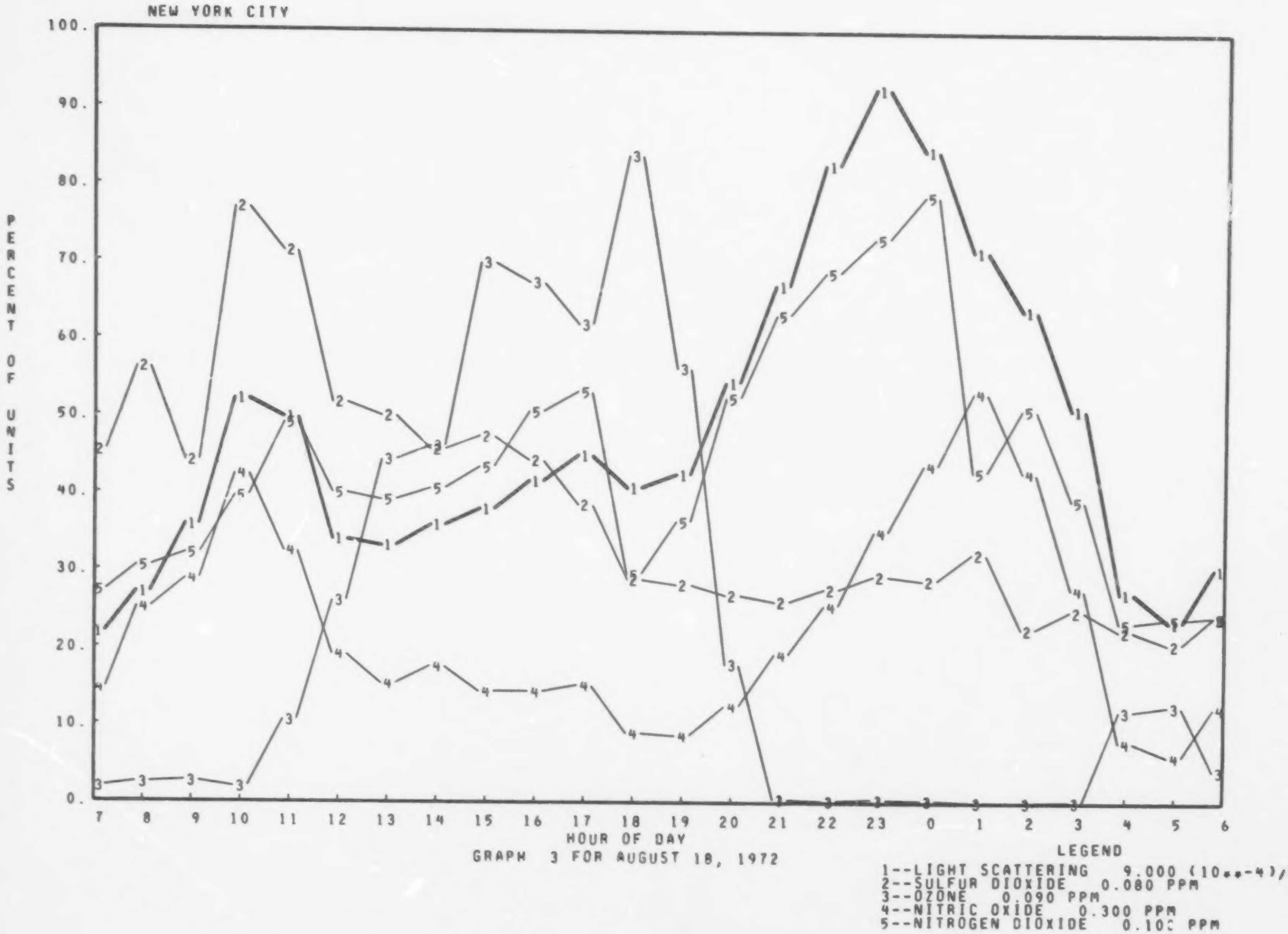

GRAPH 3 FOR AUGUST 18, 1972

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          SUBSTANCE                          AVERAGE FOR AUGUST 19, 1972


  6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                      0.386
  7--WIND SPEED (MPH)                                       7.794
  8--WIND DIRECTION (DEGREES)                             144.755
  9--TEMPERATURE (CENTIGRADE)                              23.812
 10--RELATIVE HUMIDITY (PERCENT)                           56.456
 11--LIGHT SCATTERING ((10**-4)/M)                          1.411
 12--SULFUR DIOXIDE (PPM)                                   0.022
 13--OZONE (PPM)                                            0.037
 14--NITRIC OXIDE (PPM)                                     0.037
 15--NITROGEN DIOXIDE (PPM)                                 0.015
 16--NITROGEN OXIDES (PPM)                                  0.054
 17--CARBON MONOXIDE (PPM)                                  0.982
 18--METHANE (PPM)                                          1.431
 19--TOTAL HYDROCARBON (PPM)                                3.826
 20--ETHYLENE (PPM)                                         0.007
 21--ACETYLENE (PPM)                                        0.004
 30--NON-METHANE HYDROCARBON (PPM)                          2.698




          SUBSTANCE                          MAX CONCENTRATION  HOUR  FOR AUGUST 19, 1972


 11--LIGHT SCATTERING ((10**-4)/M)                 2.480          7
 12--SULFUR DIOXIDE (PPM)                          0.028          0
 13--OZONE (PPM)                                   0.087         16
 14--NITRIC OXIDE (PPM)                            0.116          1
 15--NITROGEN DIOXIDE (PPM)                        0.035         23
 16--NITROGEN OXIDES (PPM)                         0.146          0
 17--CARBON MONOXIDE (PPM)                         2.147         23
                                                                  0
 20--ETHYLENE (PPM)                                0.019          1
 21--ACETYLENE (PPM)                               0.009          0
                                                                  1
 30--NON-METHANE HYDROCARBON (PPM)                 4.637         18
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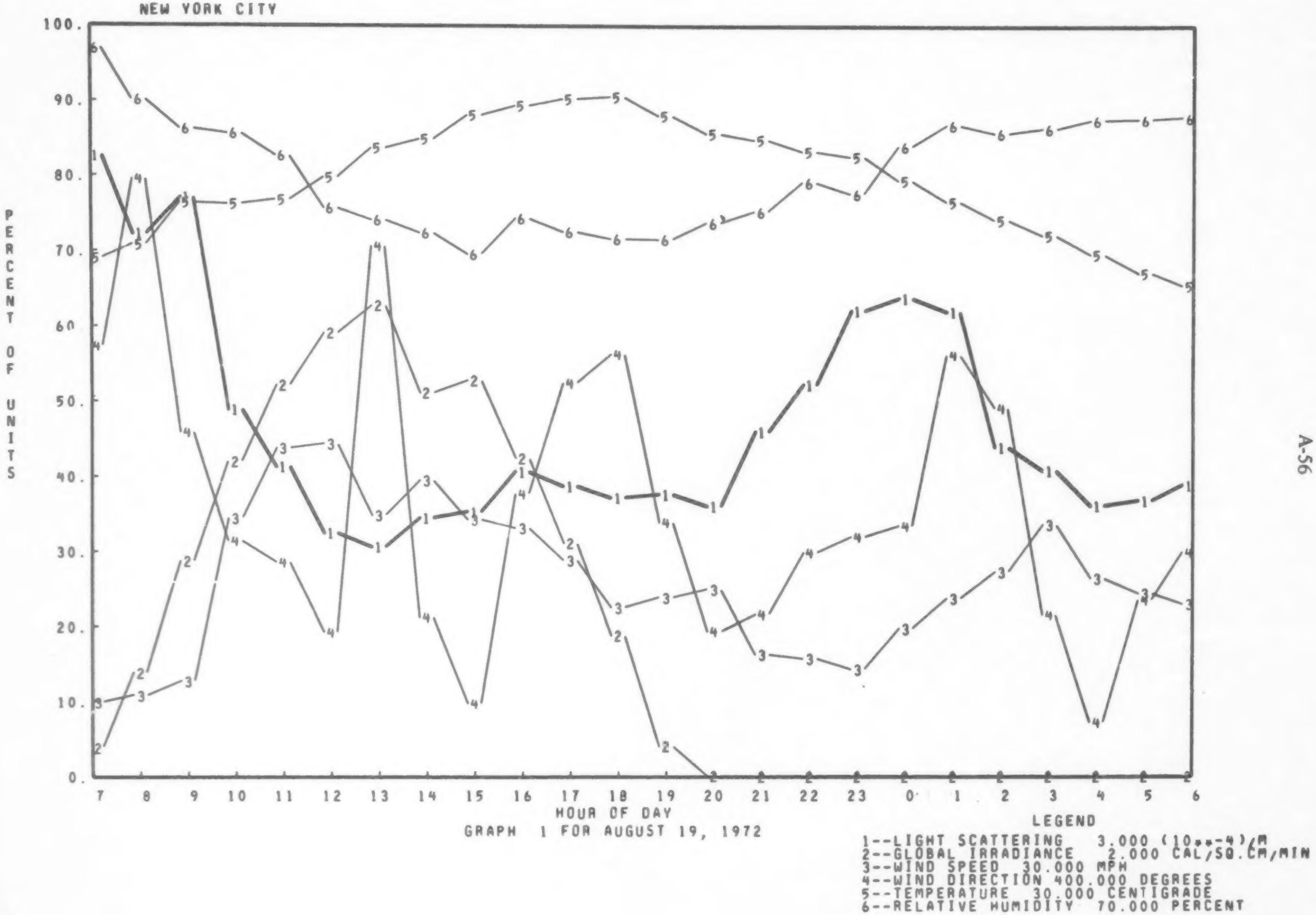

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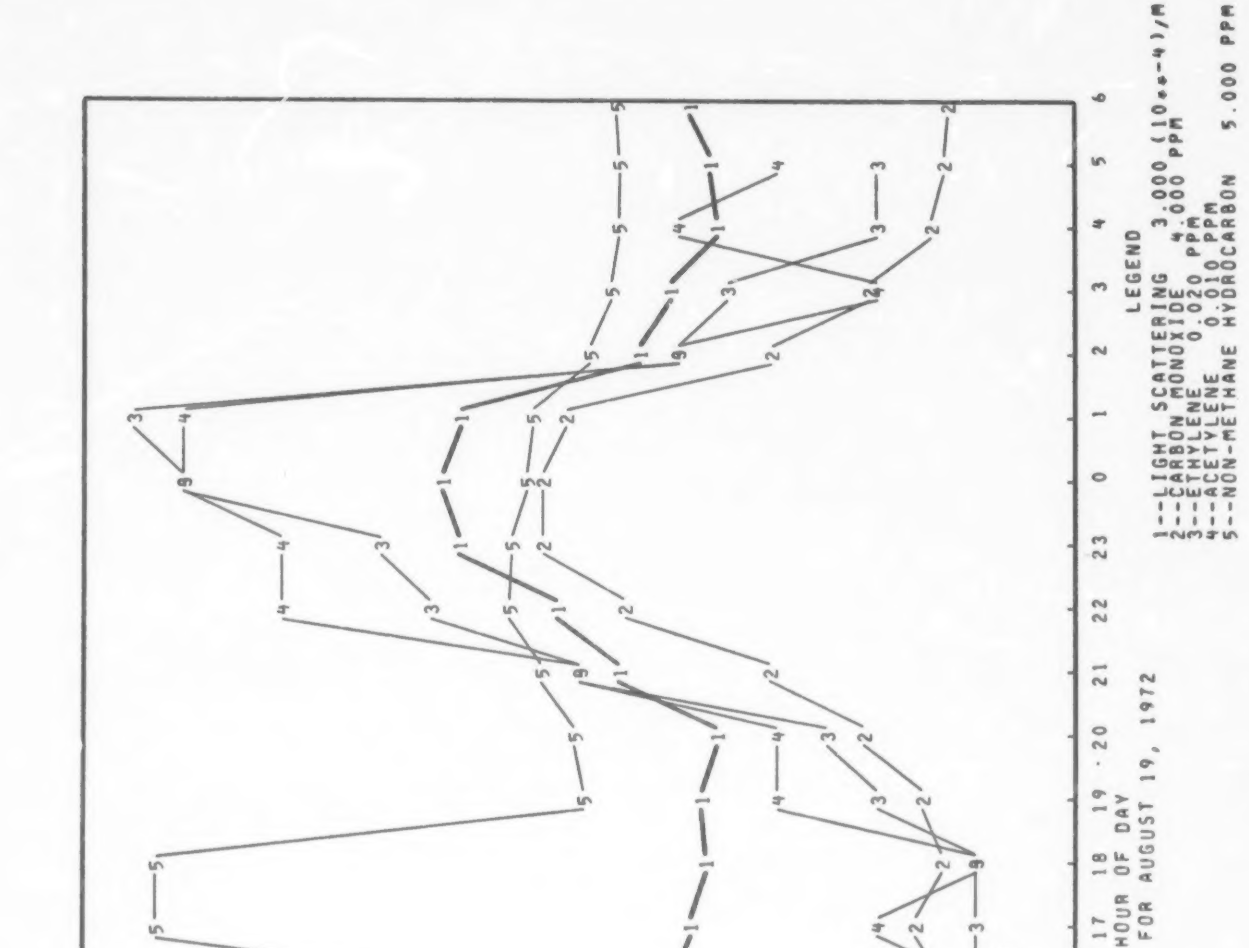

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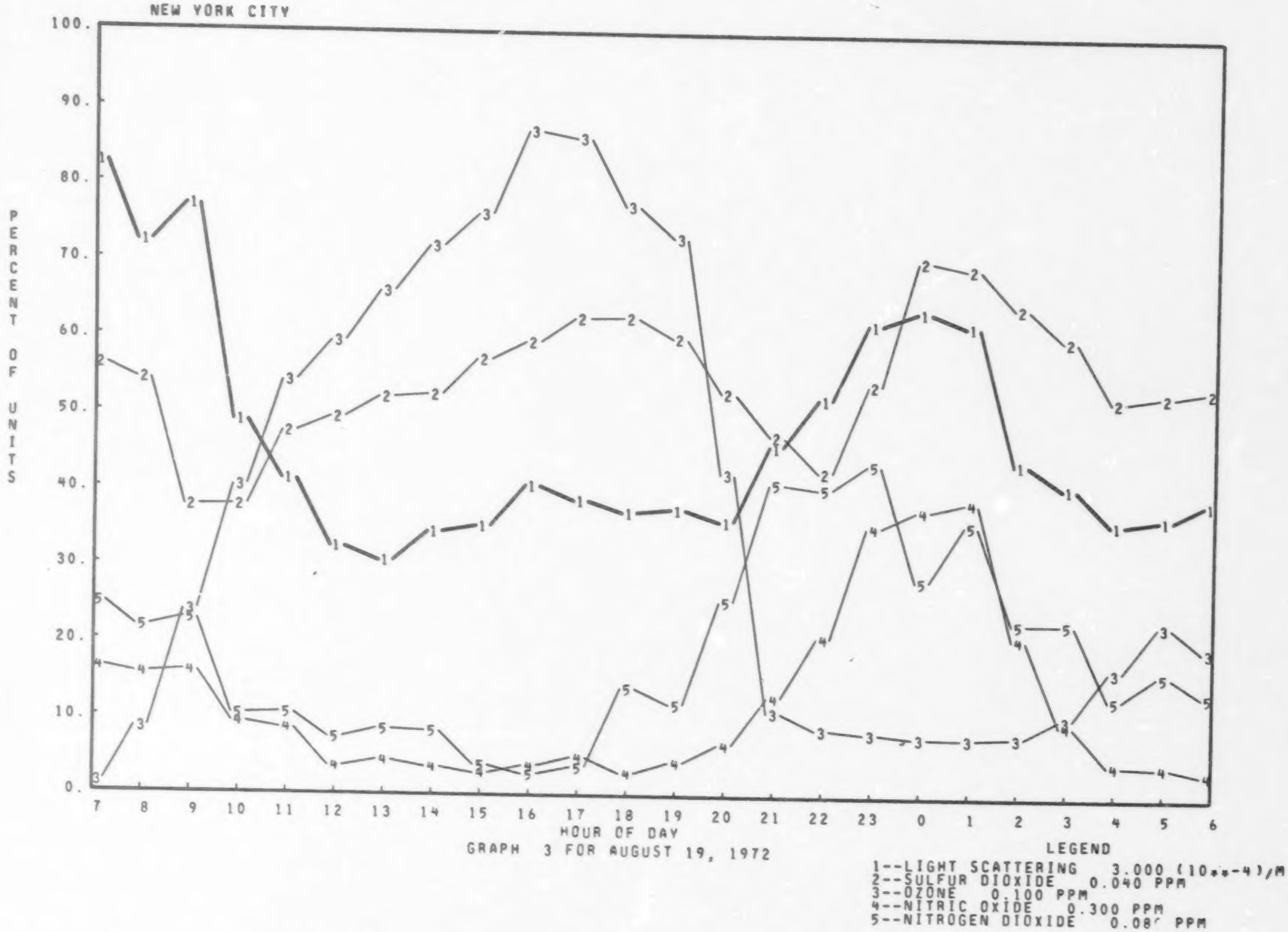
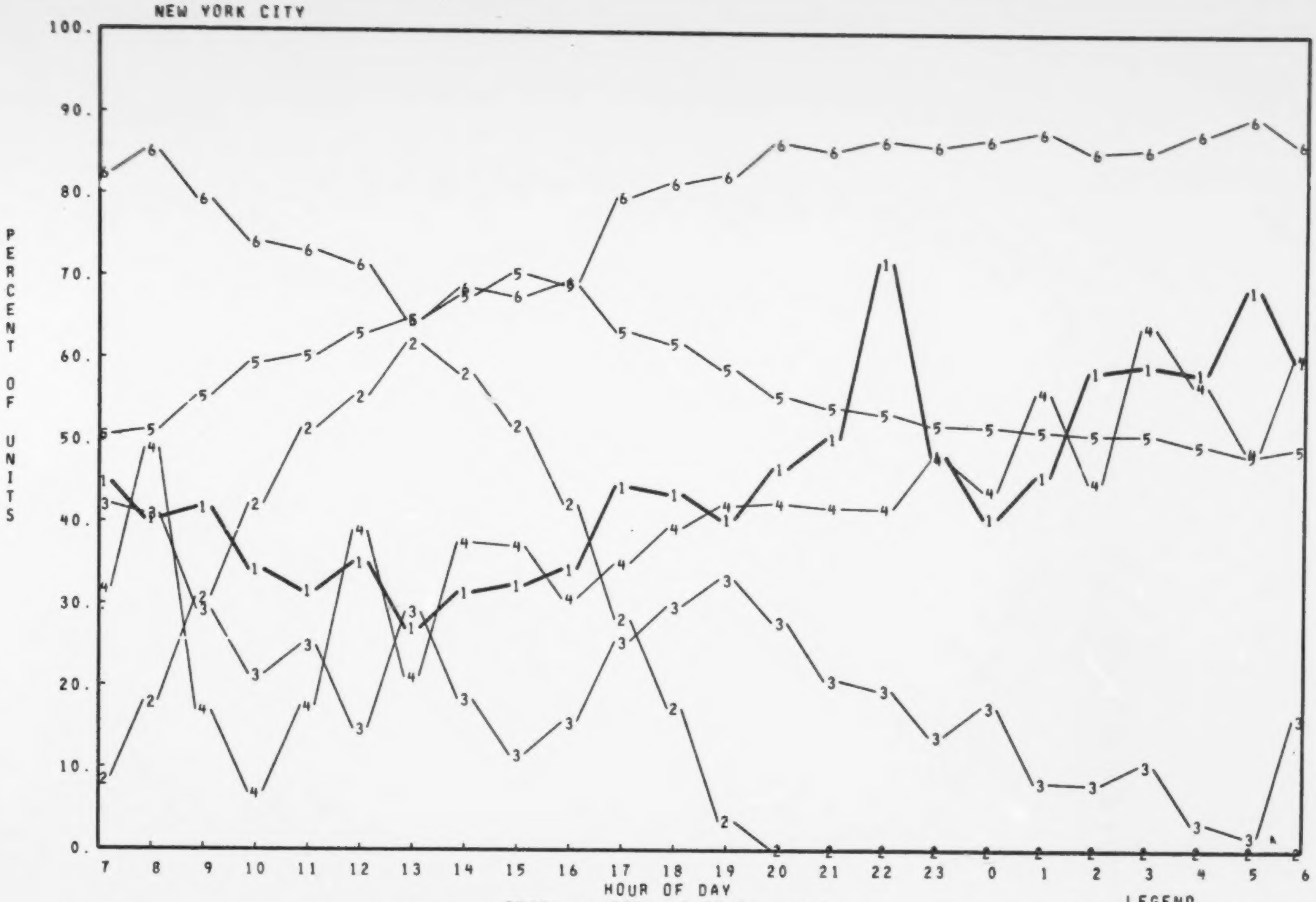


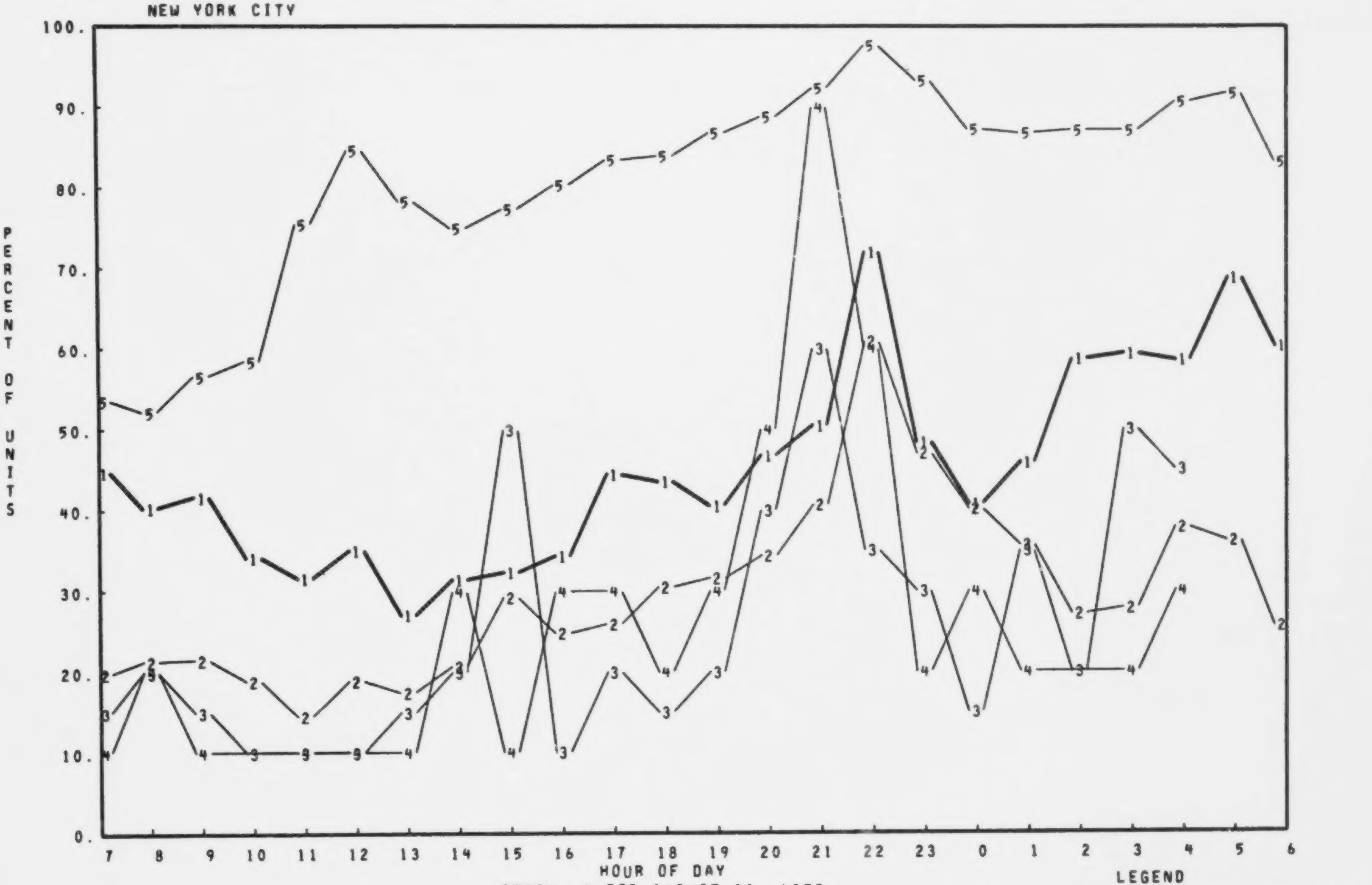
GRAPH 3 FOR AUGUST 19, 1972

```
          SUBSTANCE                      AVERAGE FOR AUGUST 20, 1972


 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)               0.391
 7--WIND SPEED (MPH)                                4.047
 8--WIND DIRECTION (DEGREES)                      159.087
 9--TEMPERATURE (CENTIGRADE)                       22.705
10--RELATIVE HUMIDITY (PERCENT)                    56.444
11--LIGHT SCATTERING ((10**-4)/M)                   1.364
12--SULFUR DIOXIDE (PPM)                            0.019
13--OZONE (PPM)                                     0.040
14--NITRIC OXIDE (PPM)                              0.029
15--NITROGEN DIOXIDE (PPM)                          0.022
16--NITROGEN OXIDES (PPM)                           0.057
17--CARBON MONOXIDE (PPM)                           0.885
18--METHANE (PPM)                                   1.525
19--TOTAL HYDROCARBON (PPM)                         3.939
20--ETHYLENE (PPM)                                  0.005
21--ACETYLENE (PPM)                                 0.003
30--NON-METHANE HYDROCARBON (PPM)                   2.414




          SUBSTANCE                      MAX CONCENTRATION  HOUR  FOR AUGUST 20, 1972


11--LIGHT SCATTERING ((10**-4)/M)              2.160        22
12--SULFUR DIOXIDE (PPM)                       0.047         4
13--OZONE (PPM)                                0.119        17
14--NITRIC OXIDE (PPM)                         0.062         6
15--NITROGEN DIOXIDE (PPM)                     0.042        22
16--NITROGEN OXIDES (PPM)                      0.107         6
17--CARBON MONOXIDE (PPM)                      1.827        22
20--ETHYLENE (PPM)                             0.012        21
21--ACETYLENE (PPM)                            0.009        21
30--NON-METHANE HYDROCARBON (PPM)              2.927        22
```

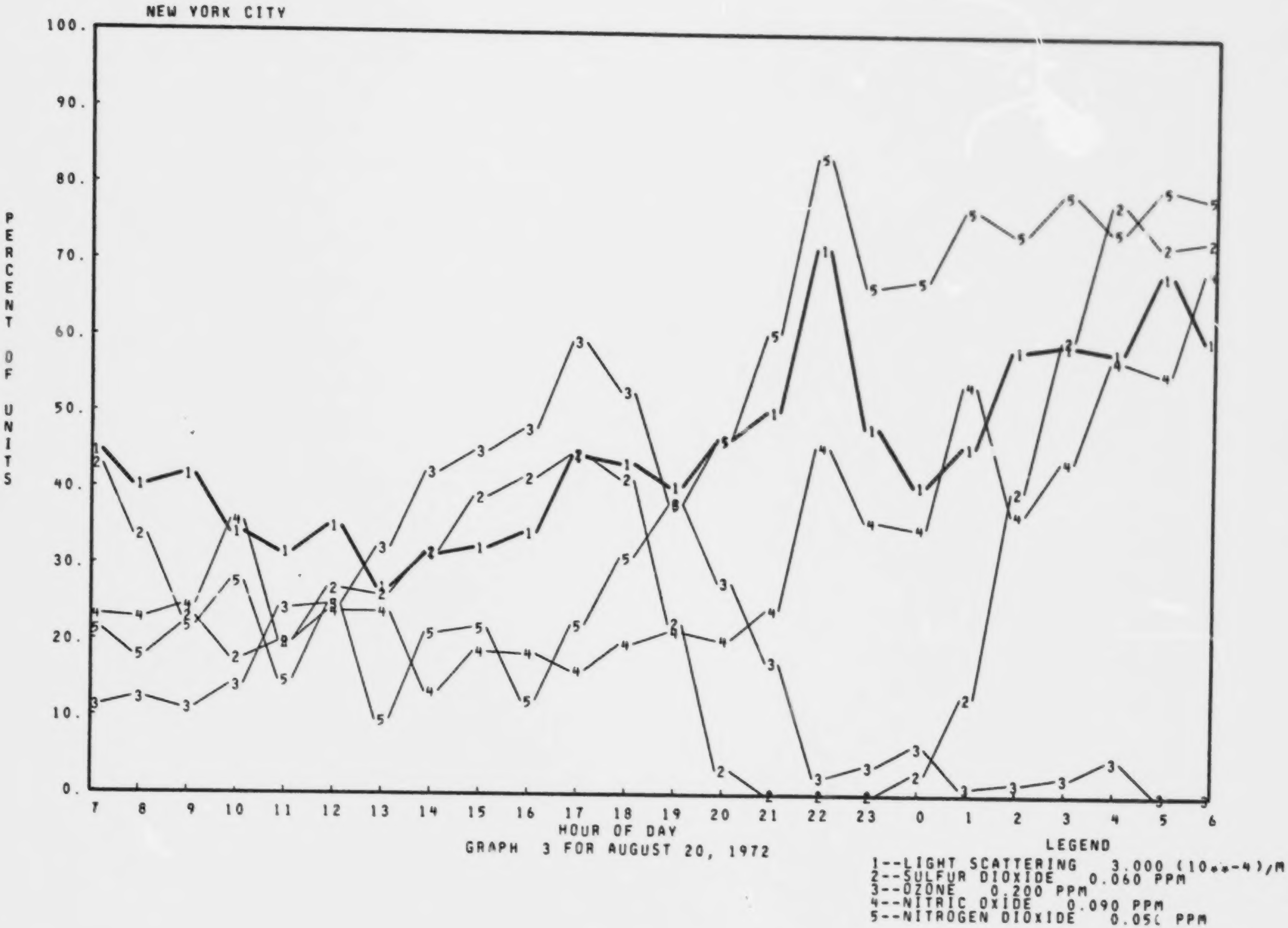


GRAPH 1 FOR AUGUST 20, 1972

LEGEND
1--LIGHT SCATTERING 3.000 (10**-4)/M
2--GLOBAL IRRADIANCE 2.000 CAL/SQ.CM/MIN
3--WIND SPEED 20.000 MPH
4--WIND DIRECTION 400.000 DEGREES
5--TEMPERATURE 40.000 CENTIGRADE
6--RELATIVE HUMIDITY 70.000 PERCENT

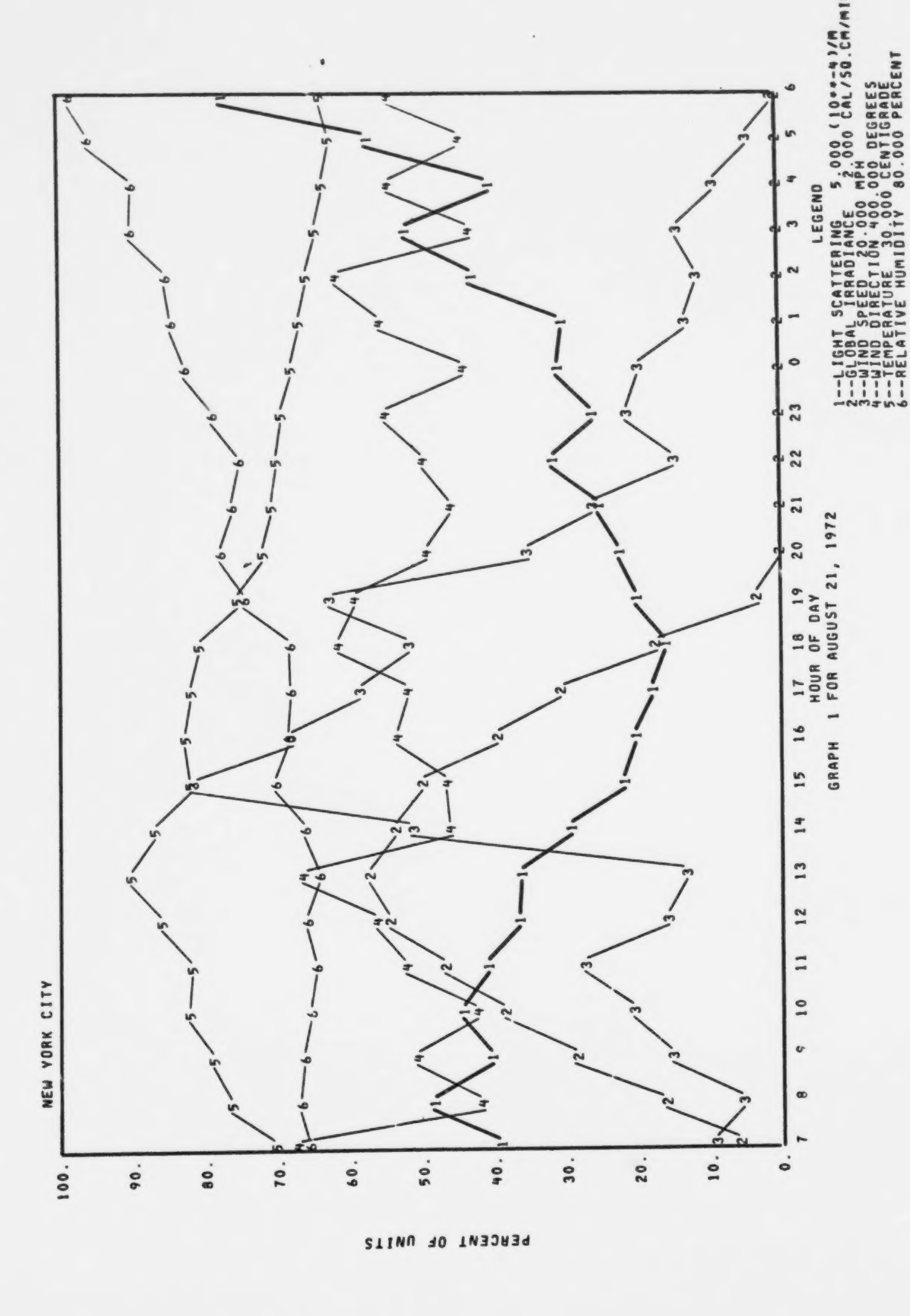


GRAPH 2 FOR AUGUST 20, 1972



GRAPH 3 FOR AUGUST 20, 1972

```
          SUBSTANCE                         AVERAGE FOR AUGUST 21, 1972


 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                  0.368
  7--WIND SPEED (MPH)                                   5.410
  8--WIND DIRECTION (DEGREES)                         208.190
  9--TEMPERATURE (CENTIGRADE)                          22.367
 10--RELATIVE HUMIDITY (PERCENT)                       60.258
 11--LIGHT SCATTERING ((10**-4)/M)                      1.760
 12--SULFUR DIOXIDE (PPM)                               0.028
 13--OZONE (PPM)                                        0.030
 14--NITRIC OXIDE (PPM)                                 0.026
 15--NITROGEN DIOXIDE (PPM)                             0.036
 16--NITROGEN OXIDES (PPM)                              0.068
 17--CARBON MONOXIDE (PPM)                              0.952
 18--METHANE (PPM)                                      1.601
 19--TOTAL HYDROCARBON (PPM)                            4.667
 20--ETHYLENE (PPM)                                     0.005
 21--ACETYLENE (PPM)                                    0.003
 30--NON-METHANE HYDROCARBON (PPM)                      3.066



          SUBSTANCE                         MAX CONCENTRATION  HOUR  FOR AUGUST 21, 1972


 11--LIGHT SCATTERING ((10**-4)/M)                  3.848          6
 12--SULFUR DIOXIDE (PPM)                           0.055          2
 13--OZONE (PPM)                                    0.095         15
 14--NITRIC OXIDE (PPM)                             0.105          8
 15--NITROGEN DIOXIDE (PPM)                         0.072         11
 16--NITROGEN OXIDES (PPM)                          0.160          8
 17--CARBON MONOXIDE (PPM)                          2.157          8
 20--ETHYLENE (PPM)                                 0.014          7
 21--ACETYLENE (PPM)                                0.008          7
 30--NON-METHANE HYDROCARBON (PPM)                  3.470         21
```



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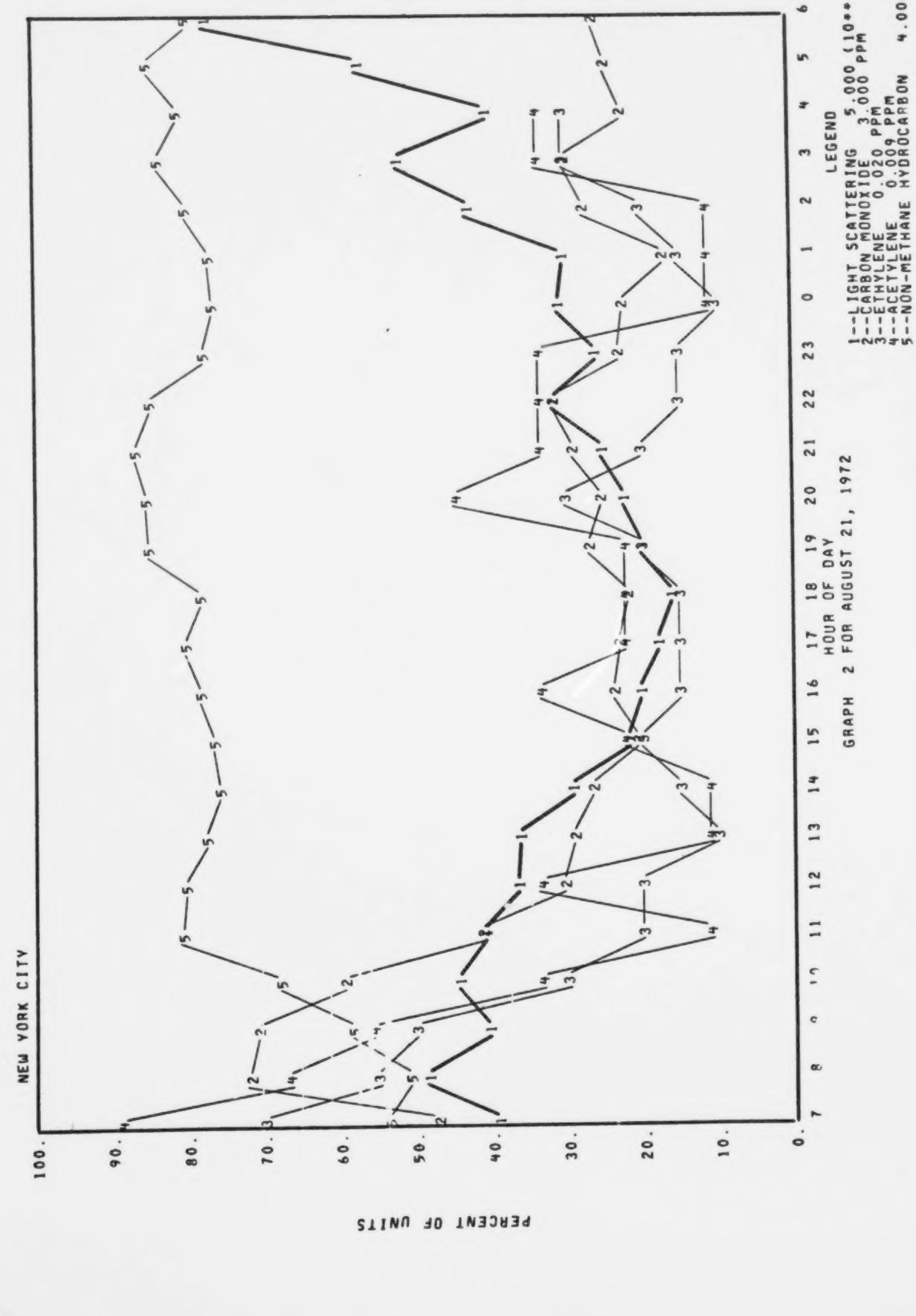

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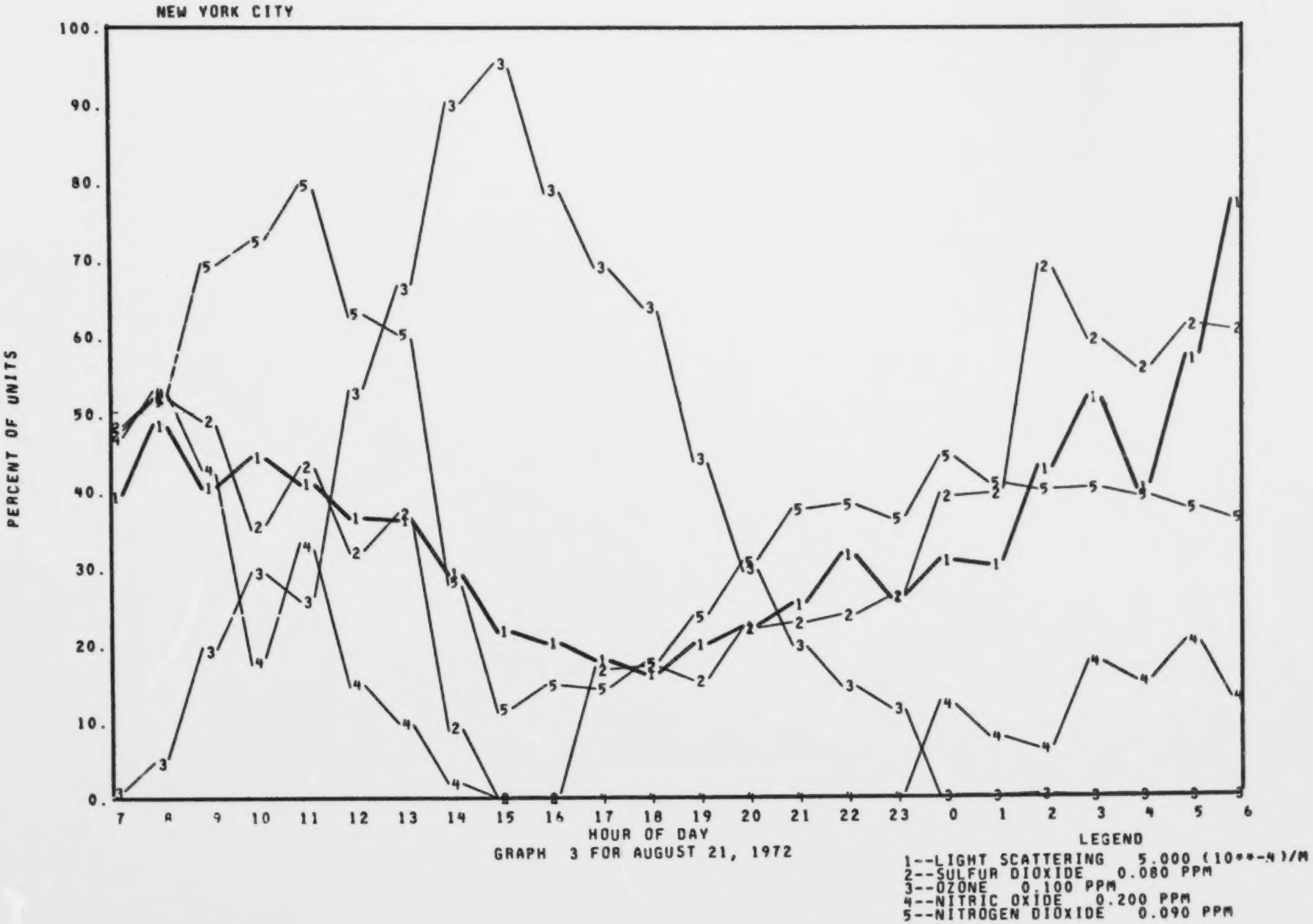

GRAPH 3 FOR AUGUST 21, 1972

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          SUBSTANCE                              AVERAGE FOR AUGUST 22, 1972

 --GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                    0.334
 --WIND SPEED (MPH)                                     5.902
 --WIND DIRECTION (DEGREES)                           216.330
 --TEMPERATURE (CENTIGRADE)                            22.799
0--RELATIVE HUMIDITY (PERCENT)                         65.134
1--LIGHT SCATTERING ((10**-4)/M)                        2.689
2--SULFUR DIOXIDE (PPM)                                 0.008
3--OZONE (PPM)                                          0.054
4--NITRIC OXIDE (PPM)                                   0.027
5--NITROGEN DIOXIDE (PPM)                               0.039
6--NITROGEN OXIDES (PPM)                                0.068
7--CARBON MONOXIDE (PPM)                                1.177
8--METHANE (PPM)                                        1.643
9--TOTAL HYDROCARBON (PPM)                              4.724
0--ETHYLENE (PPM)                                       0.006
1--ACETYLENE (PPM)                                      0.003
0--NON-METHANE HYDROCARBON (PPM)                        3.081



          SUBSTANCE                              MAX CONCENTRATION  HOUR  FOR AUGUST 22, 1972

11--LIGHT SCATTERING ((10**-4)/M)                      4.467        11
12--SULFUR DIOXIDE (PPM)                               0.023        17
13--OZONE (PPM)                                        0.164        15
14--NITRIC OXIDE (PPM)                                 0.103        10
15--NITROGEN DIOXIDE (PPM)                             0.090        11
16--NITROGEN OXIDES (PPM)                              0.171        10
17--CARBON MONOXIDE (PPM)                              2.990        11
20--ETHYLENE (PPM)                                     0.019        10
21--ACETYLENE (PPM)                                    0.009         9
                                                                    10
30--NON-METHANE HYDROCARBON (PPM)                      3.677         7
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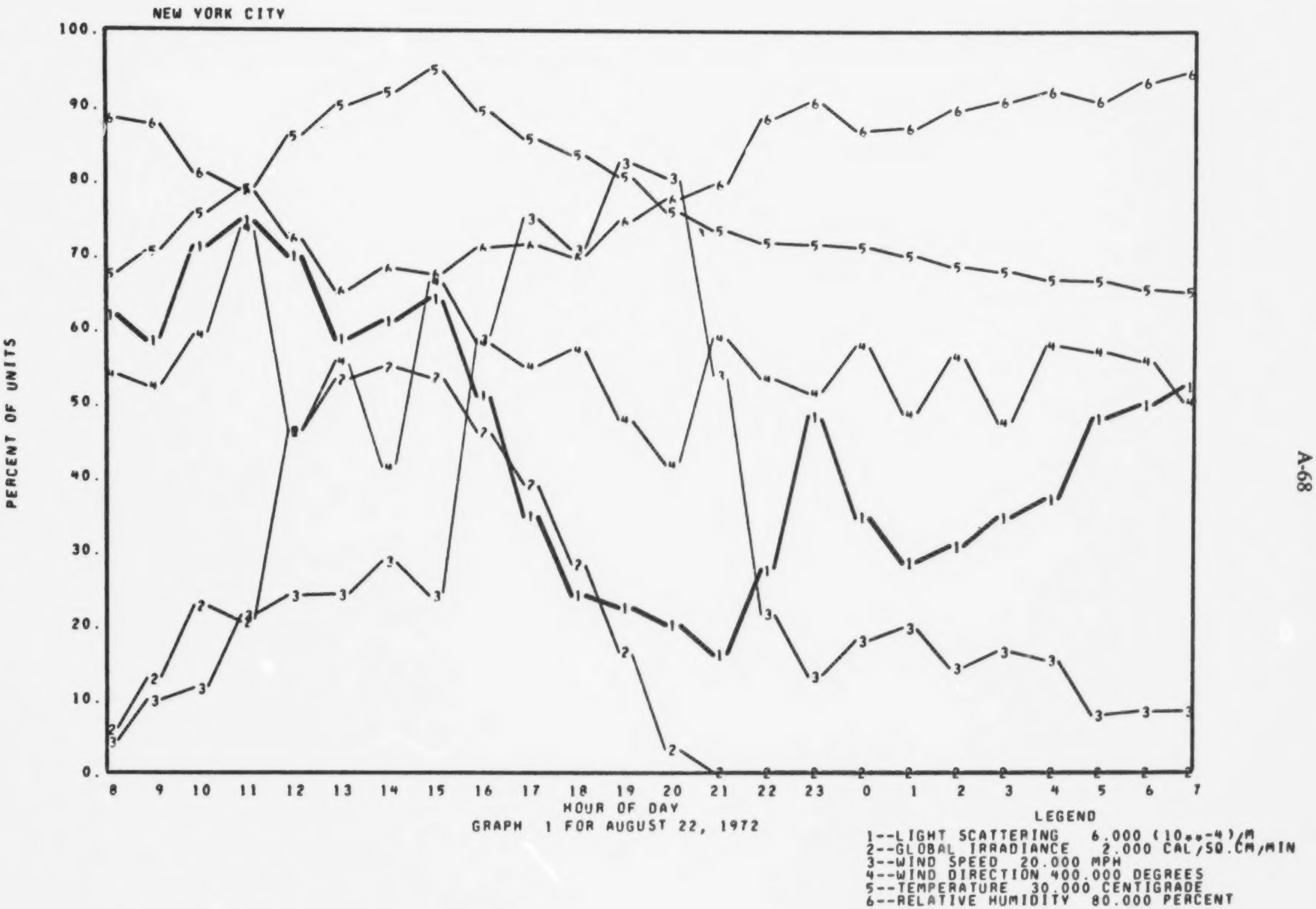

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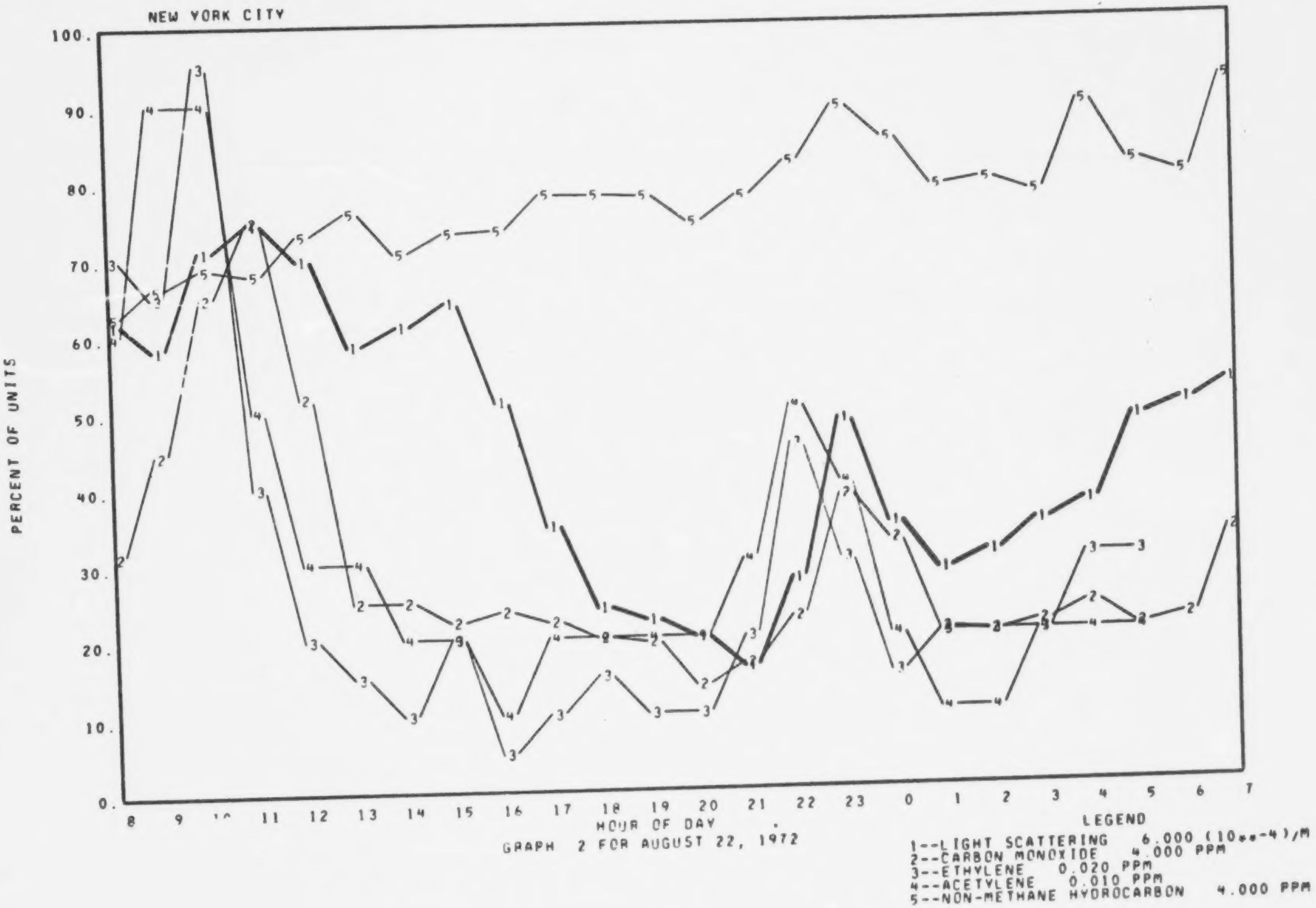

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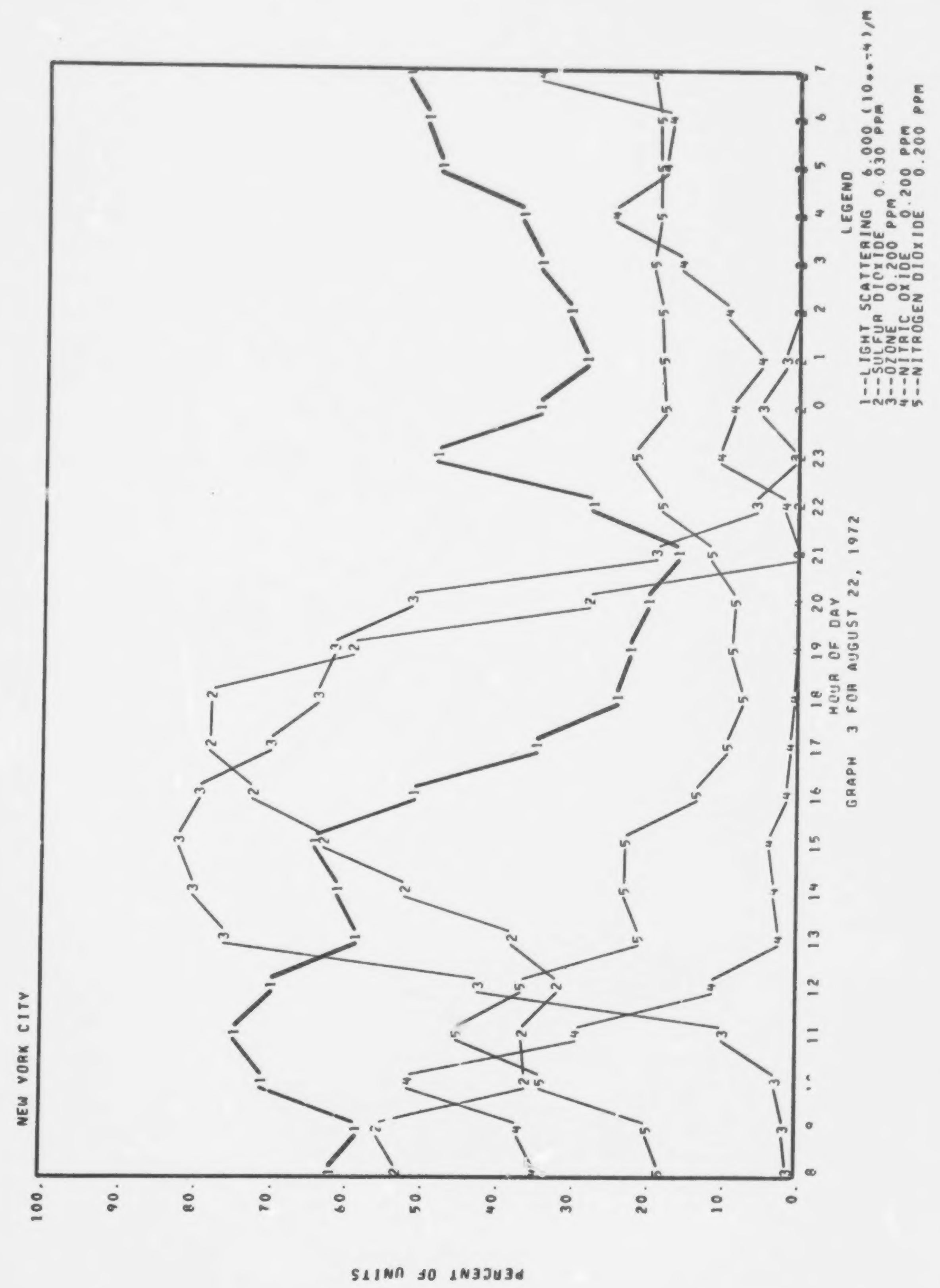

GRAPH 3 FOR AUGUST 22, 1972

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           SUBSTANCE                                AVERAGE FOR AUGUST 23, 1972

 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                      0.328
 7--WIND SPEED (MPH)                                       5.426
 8--WIND DIRECTION (DEGREES)                             205.880
 9--TEMPERATURE (CENTIGRADE)                              24.845
10--RELATIVE HUMIDITY (PERCENT)                           74.080
11--LIGHT SCATTERING ((10**-4)/M)                          3.532
12--SULFUR DIOXIDE (PPM)                                   0.020
13--OZONE (PPM)                                            0.039
14--NITRIC OXIDE (PPM)                                     0.036
15--NITROGEN DIOXIDE (PPM)                                 0.046
16--NITROGEN OXIDES (PPM)                                  0.082
17--CARBON MONOXIDE (PPM)                                  1.423
18--METHANE (PPM)                                          1.704
19--TOTAL HYDROCARBON (PPM)                                4.961
20--ETHYLENE (PPM)                                         0.008
21--ACETYLENE (PPM)                                        0.005
30--NON-METHANE HYDROCARBON (PPM)                          3.121


           SUBSTANCE                                MAX CONCENTRATION  HOUR  FOR AUGUST 23, 1972

11--LIGHT SCATTERING ((10**-4)/M)                       4.880          10
12--SULFUR DIOXIDE (PPM)                                0.028          17
13--OZONE (PPM)                                         0.144          15
14--NITRIC OXIDE (PPM)                                  0.163           8
15--NITROGEN DIOXIDE (PPM)                              0.094          10
16--NITROGEN OXIDES (PPM)                               0.212           8
17--CARBON MONOXIDE (PPM)                               3.285           8
20--ETHYLENE (PPM)                                      0.022           8
21--ACETYLENE (PPM)                                     0.013           9
30--NON-METHANE HYDROCARBON (PPM)                       3.688          20
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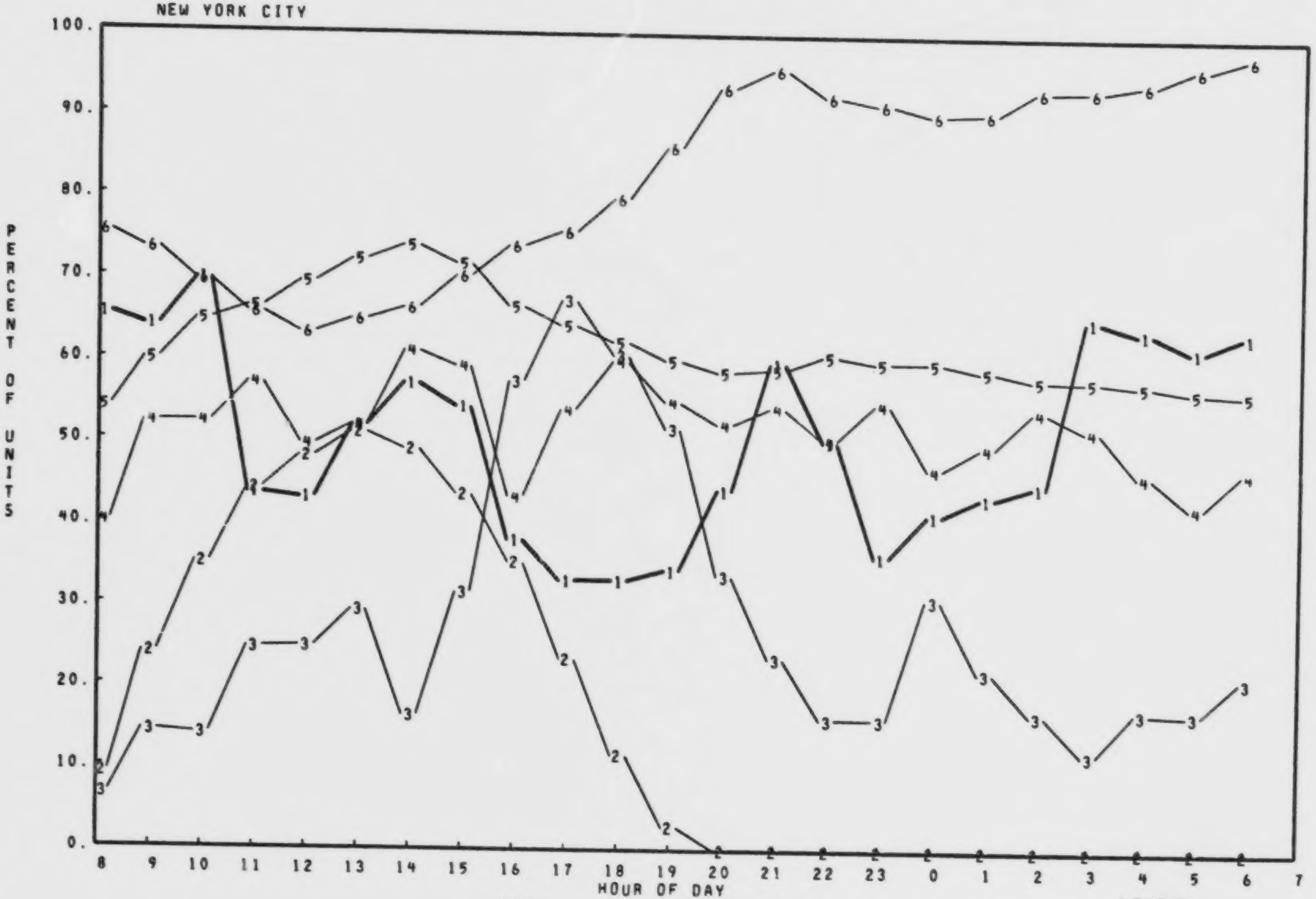

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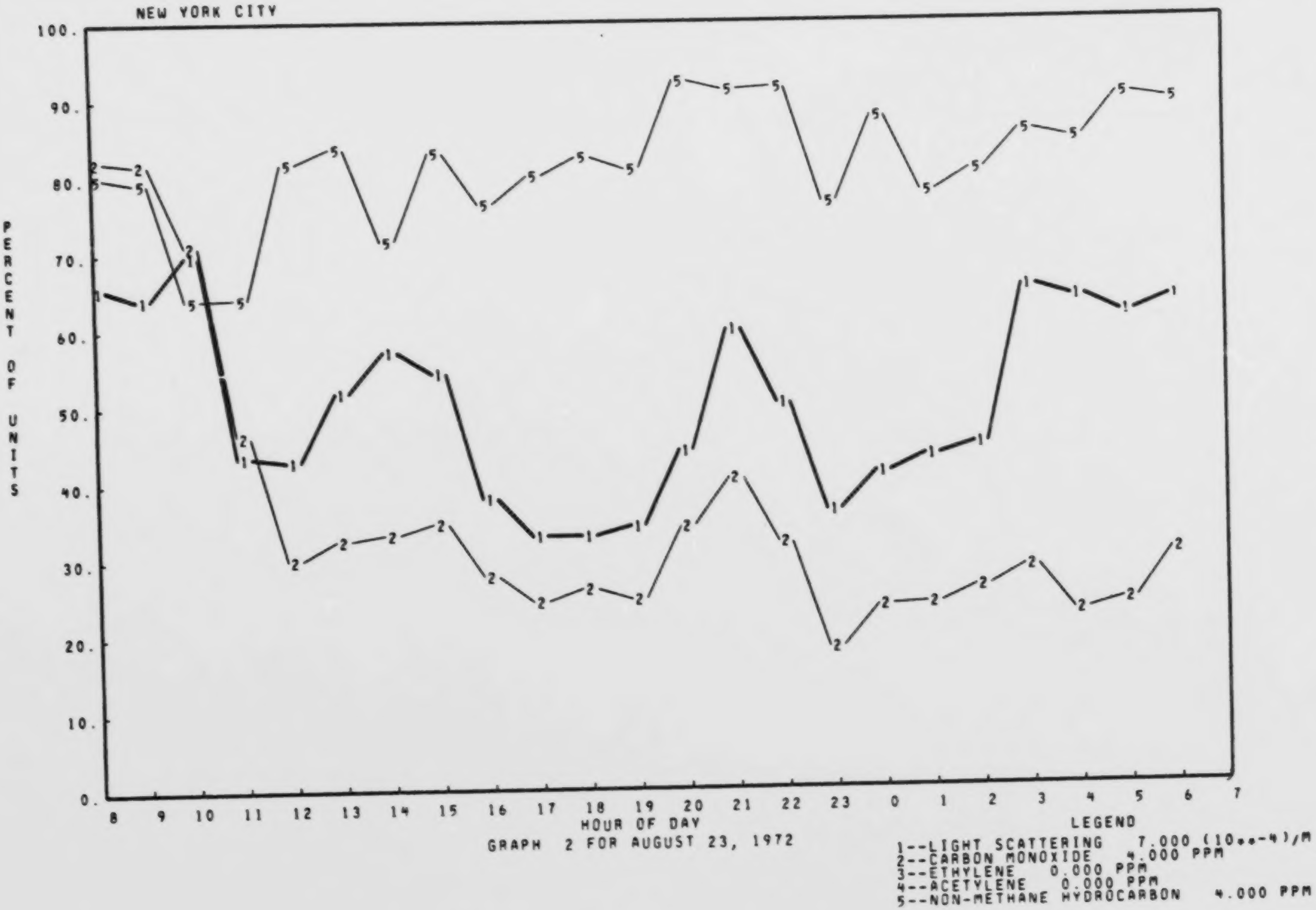

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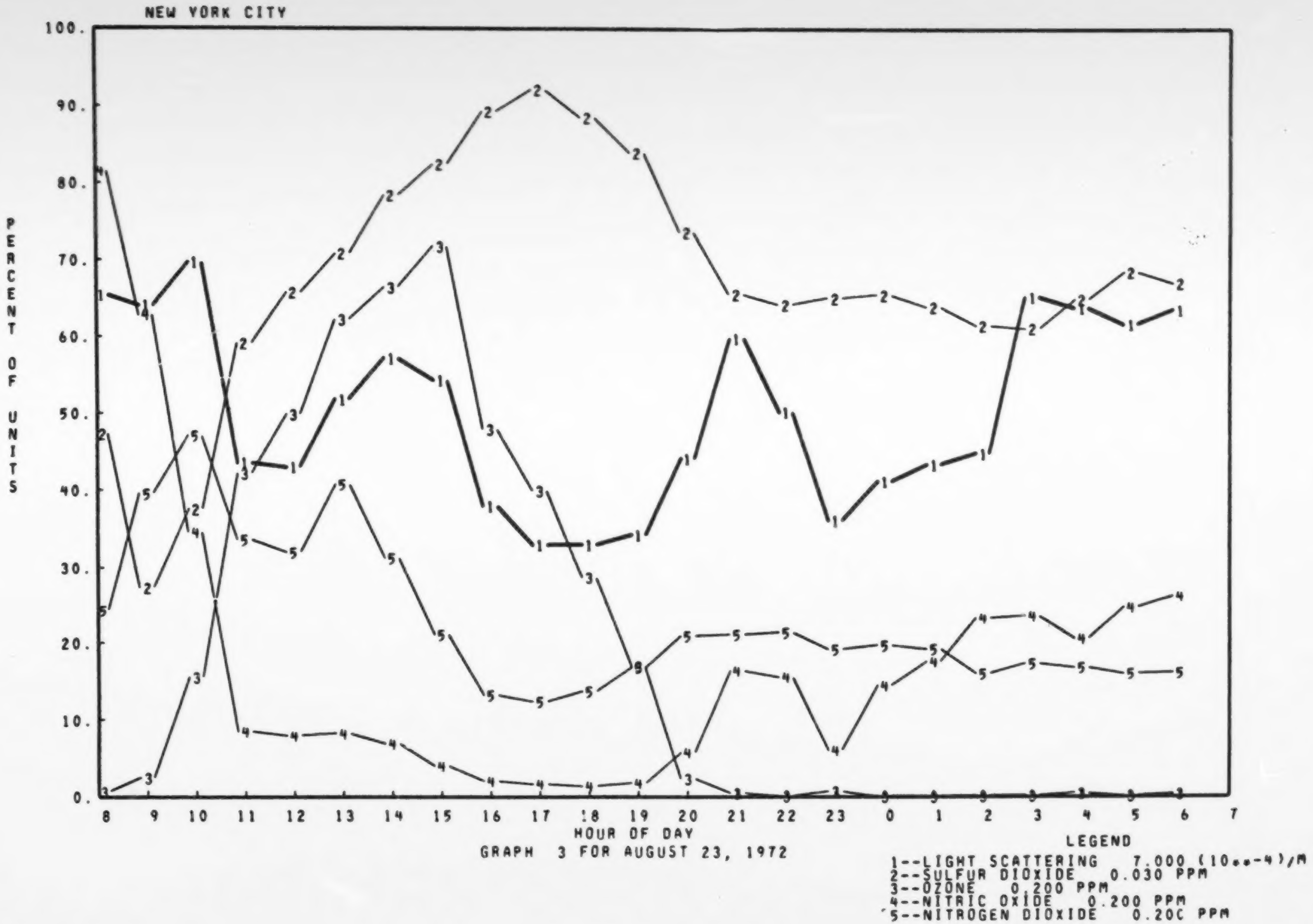

GRAPH 3 FOR AUGUST 23, 1972

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          SUBSTANCE                        AVERAGE FOR AUGUST 24, 1972


 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                 0.247
 7--WIND SPEED (MPH)                                  2.085
 8--WIND DIRECTION (DEGREES)                        216.910
 9--TEMPERATURE (CENTIGRADE)                         27.522
10--RELATIVE HUMIDITY (PERCENT)                      69.751
11--LIGHT SCATTERING ((10**-4)/M)                     4.721
12--SULFUR DIOXIDE (PPM)                              0.009
13--OZONE (PPM)                                       0.045
14--NITRIC OXIDE (PPM)                                0.031
15--NITROGEN DIOXIDE (PPM)                            0.063
16--NITROGEN OXIDES (PPM)                             0.095
17--CARBON MONOXIDE (PPM)                             1.829
18--METHANE (PPM)                                     1.628
19--TOTAL HYDROCARBON (PPM)                           4.985
20--ETHYLENE (PPM)                                    0.012
21--ACETYLENE (PPM)                                   0.007
30--NON-METHANE HYDROCARBON (PPM)                     3.217



          SUBSTANCE                        MAX CONCENTRATION  HOUR  FOR AUGUST 24, 1972


11--LIGHT SCATTERING ((10**-4)/M)                   7.535        6
12--SULFUR DIOXIDE (PPM)                            0.025       15
13--OZONE (PPM)                                     0.156       14
14--NITRIC OXIDE (PPM)                              0.098        9
15--NITROGEN DIOXIDE (PPM)                          0.093       23
16--NITROGEN OXIDES (PPM)                           0.153       10
17--CARBON MONOXIDE (PPM)                           3.328       10
20--ETHYLENE (PPM)                                  0.022       10
21--ACETYLENE (PPM)                                 0.011       10
                                                                11
30--NON-METHANE HYDROCARBON (PPM)                   4.142       20
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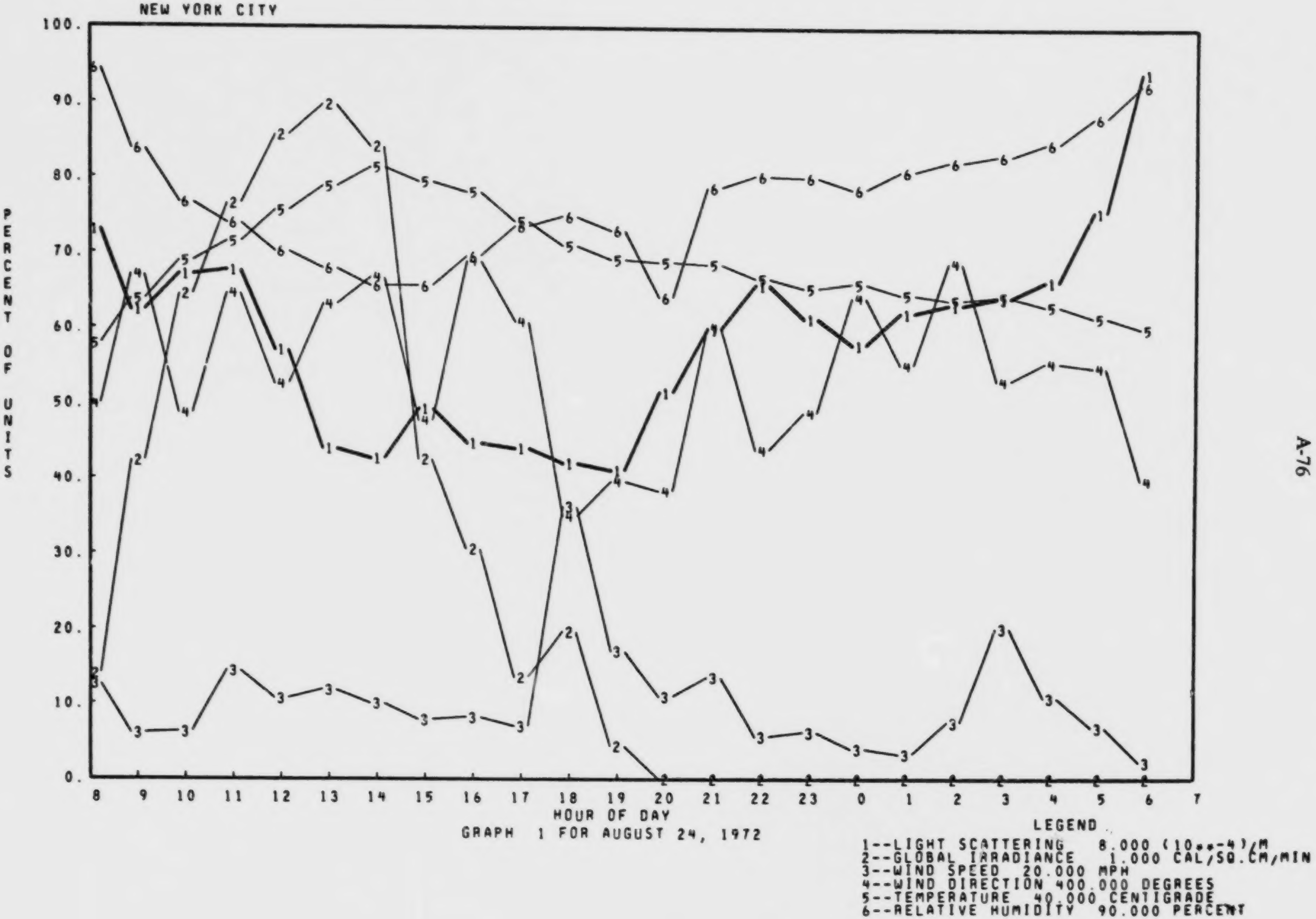
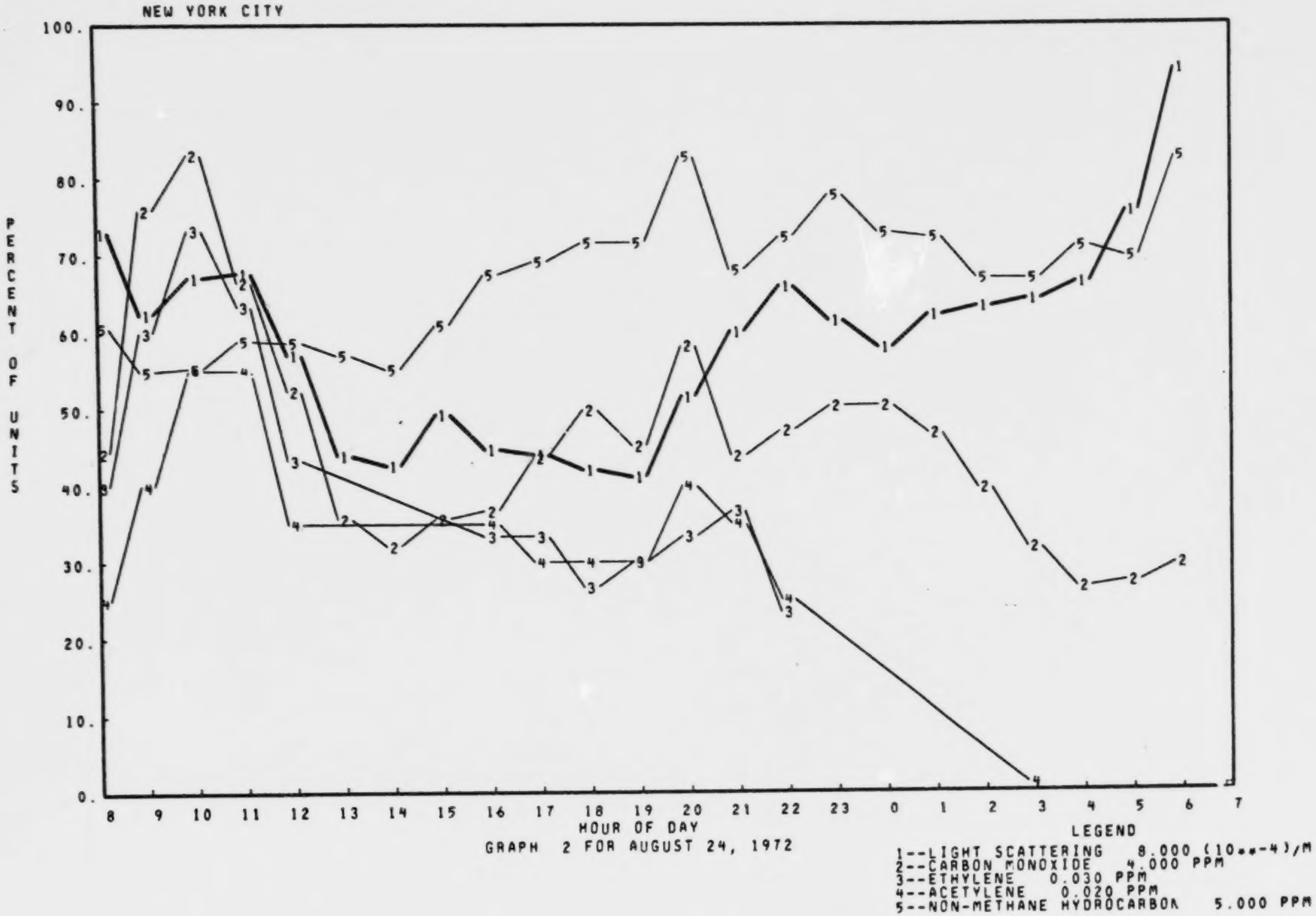


GRAPH 1 FOR AUGUST 24, 1972



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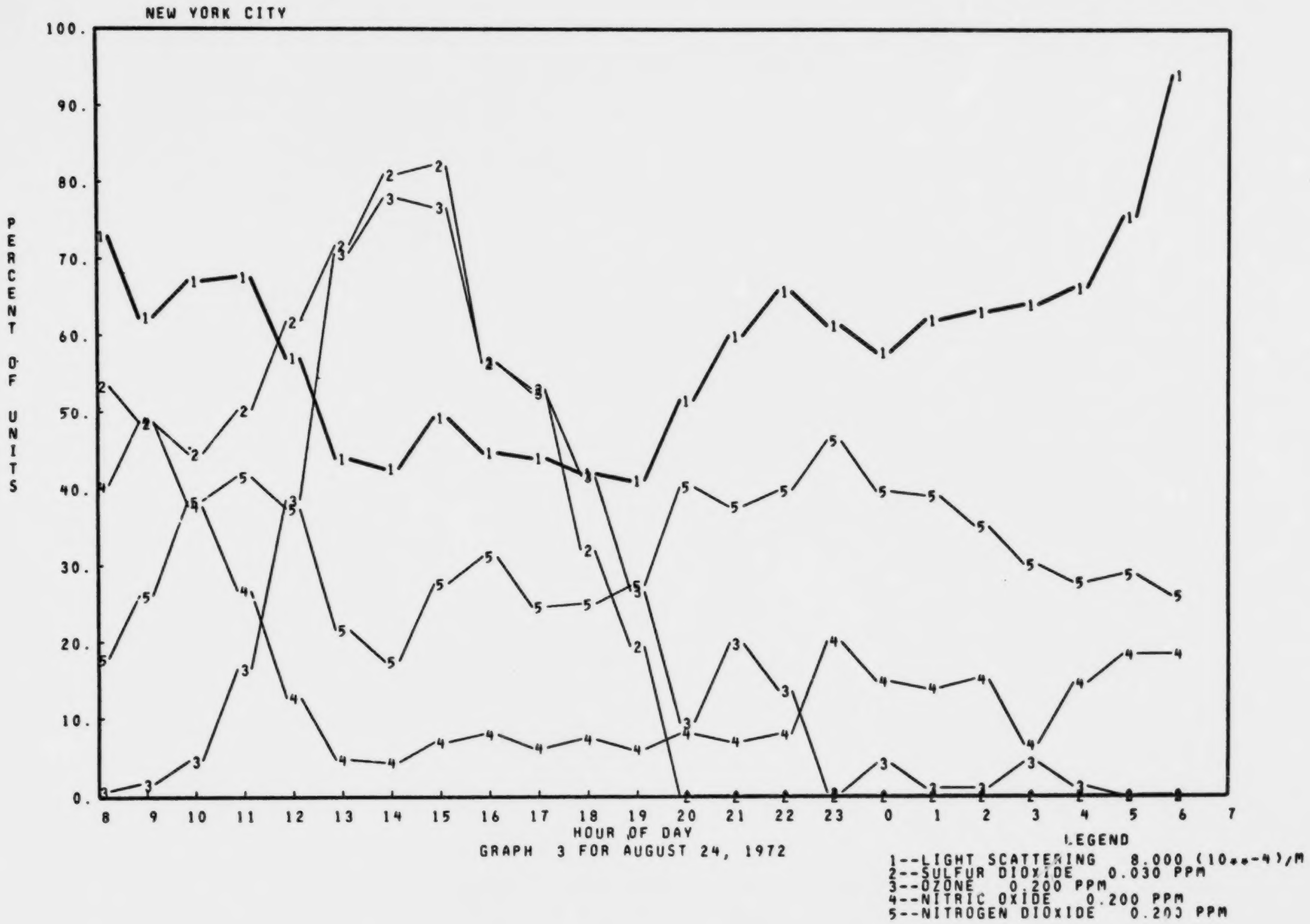

GRAPH 3 FOR AUGUST 24, 1972

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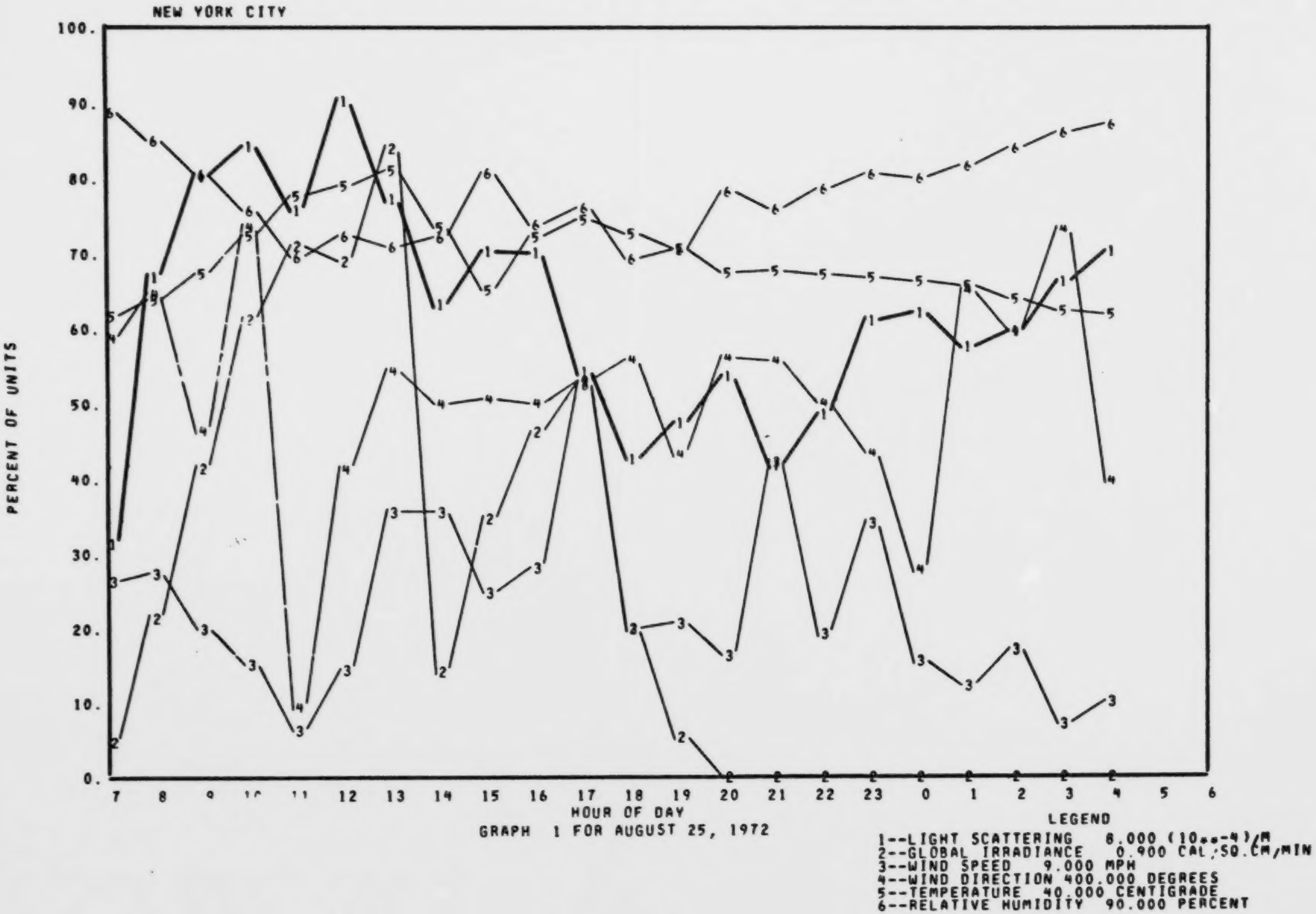
            SUBSTANCE                        AVERAGE FOR AUGUST 25, 1972


 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                 0.215
 7--WIND SPEED (MPH)                                  2.049
 8--WIND DIRECTION (DEGREES)                        203.971
 9--TEMPERATURE (CENTIGRADE)                         27.645
10--RELATIVE HUMIDITY (PERCENT)                      70.289
11--LIGHT SCATTERING ((10**-4)/M)                     4.999
12--SULFUR DIOXIDE (PPM)                              0.013
13--OZONE (PPM)                                       0.050
14--NITRIC OXIDE (PPM)                                0.044
15--NITROGEN DIOXIDE (PPM)                            0.079
16--NITROGEN OXIDES (PPM)                             0.121
17--CARBON MONOXIDE (PPM)                             2.590
18--METHANE (PPM)                                     2.133
19--TOTAL HYDROCARBON (PPM)                           5.720
20--ETHYLENE (PPM)                                    0.014
21--ACETYLENE (PPM)                                   0.007
30--NON-METHANE HYDROCARBON (PPM)                     3.289

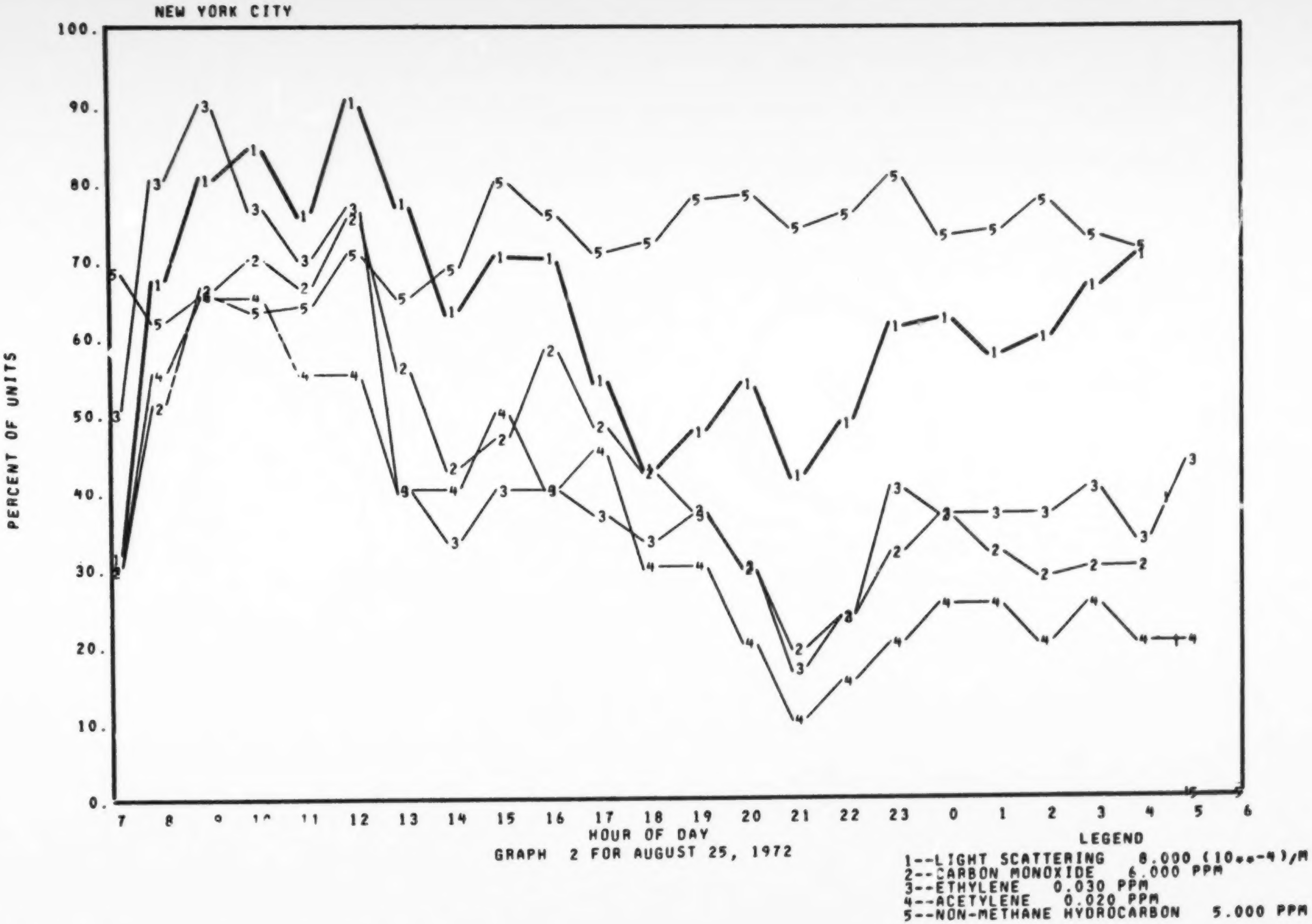


            SUBSTANCE                        MAX CONCENTRATION  HOUR  FOR AUGUST 25, 1972

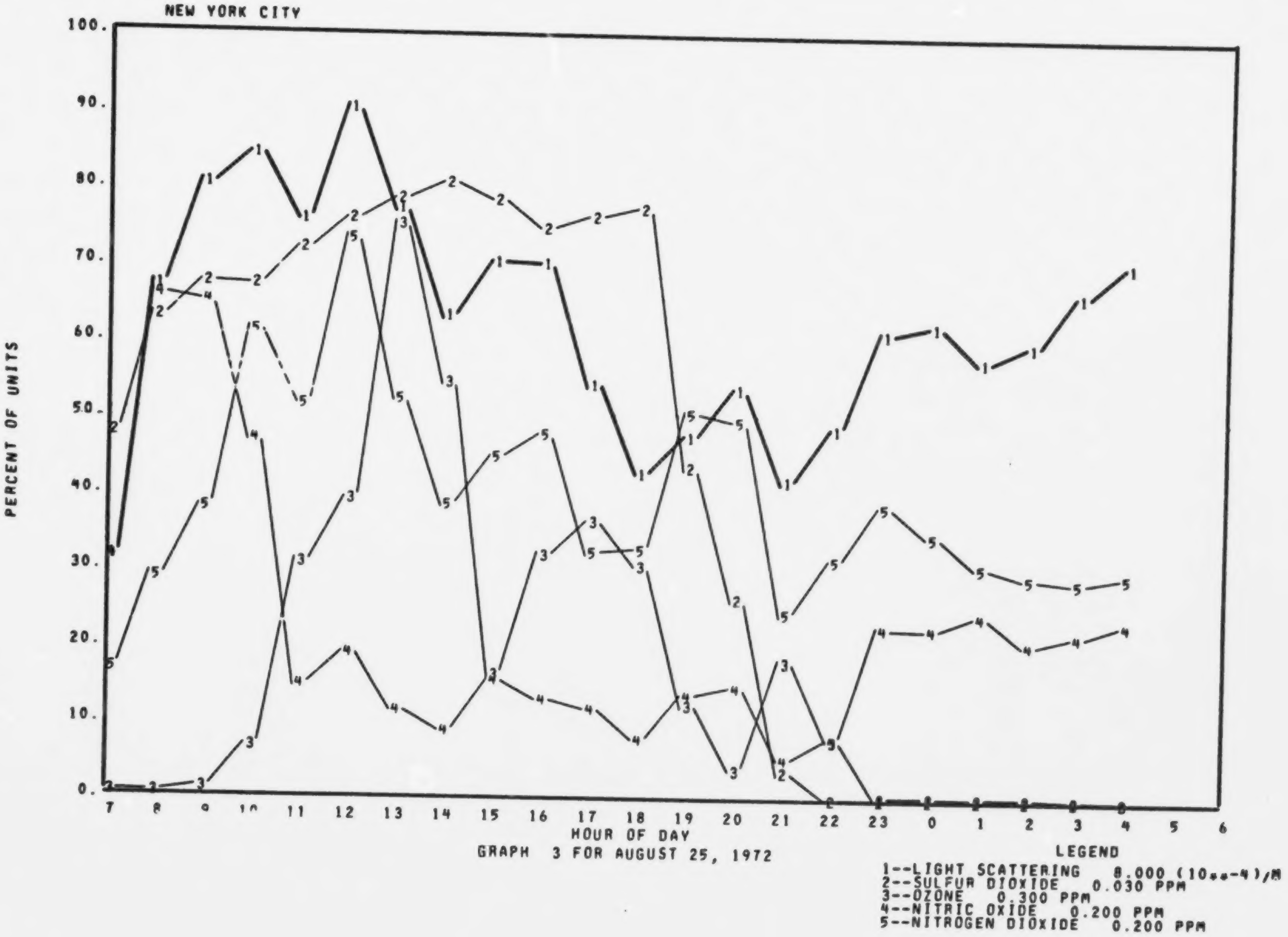

11--LIGHT SCATTERING ((10**-4)/M)                   7.227        12
12--SULFUR DIOXIDE (PPM)                            0.024        14
13--OZONE (PPM)                                     0.225        13
14--NITRIC OXIDE (PPM)                              0.131         8
15--NITROGEN DIOXIDE (PPM)                          0.147        12
16--NITROGEN OXIDES (PPM)                           0.203        10
17--CARBON MONOXIDE (PPM)                           4.517        12
20--ETHYLENE (PPM)                                  0.027         9
21--ACETYLENE (PPM)                                 0.013         9
                                                                 10
30--NON-METHANE HYDROCARBON (PPM)                   4.027        23
```



GRAPH 1 FOR AUGUST 25, 1972



GRAPH 2 FOR AUGUST 25, 1972



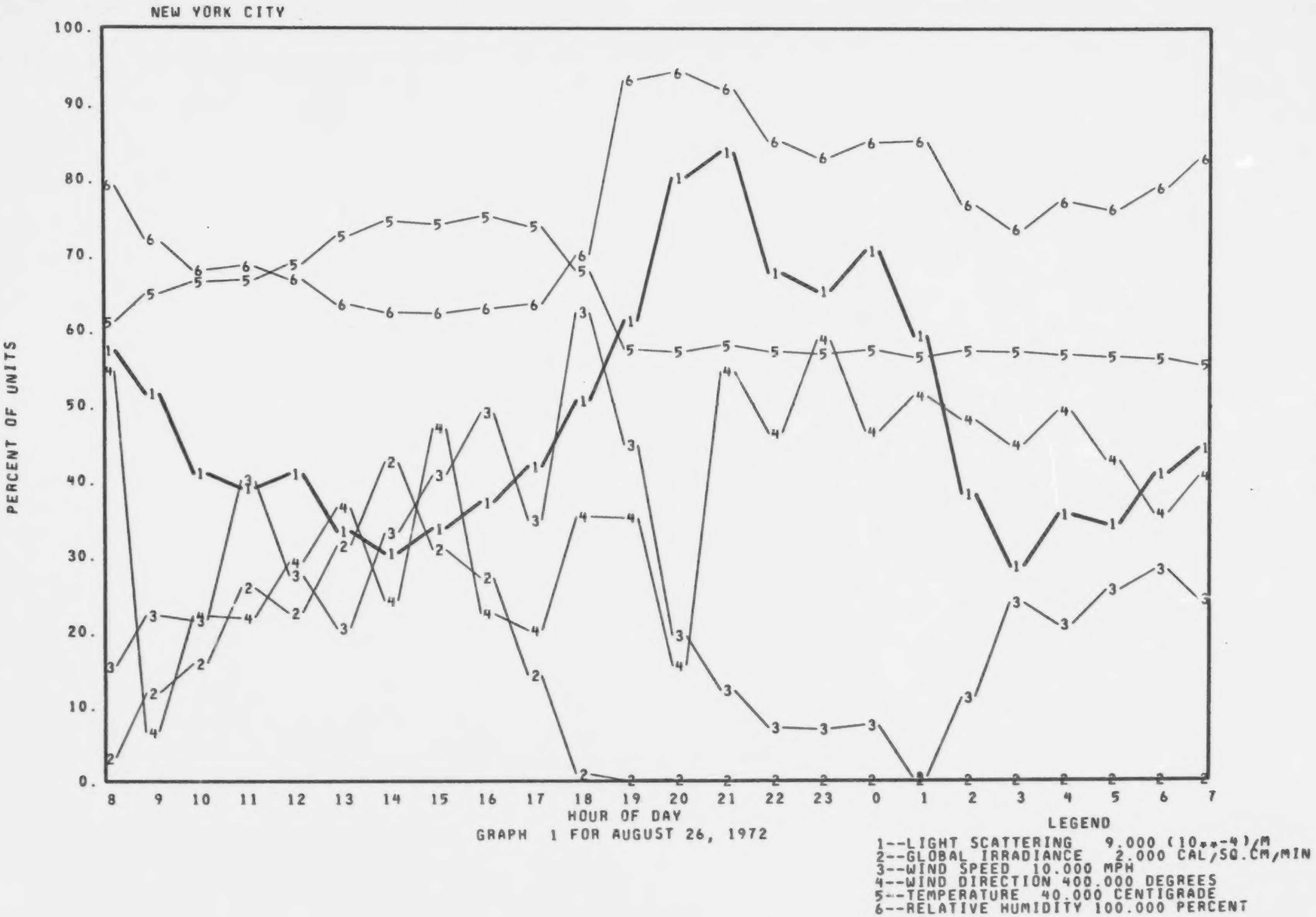
GRAPH 3 FOR AUGUST 25, 1972

```
            SUBSTANCE                              AVERAGE FOR AUGUST 26, 1972

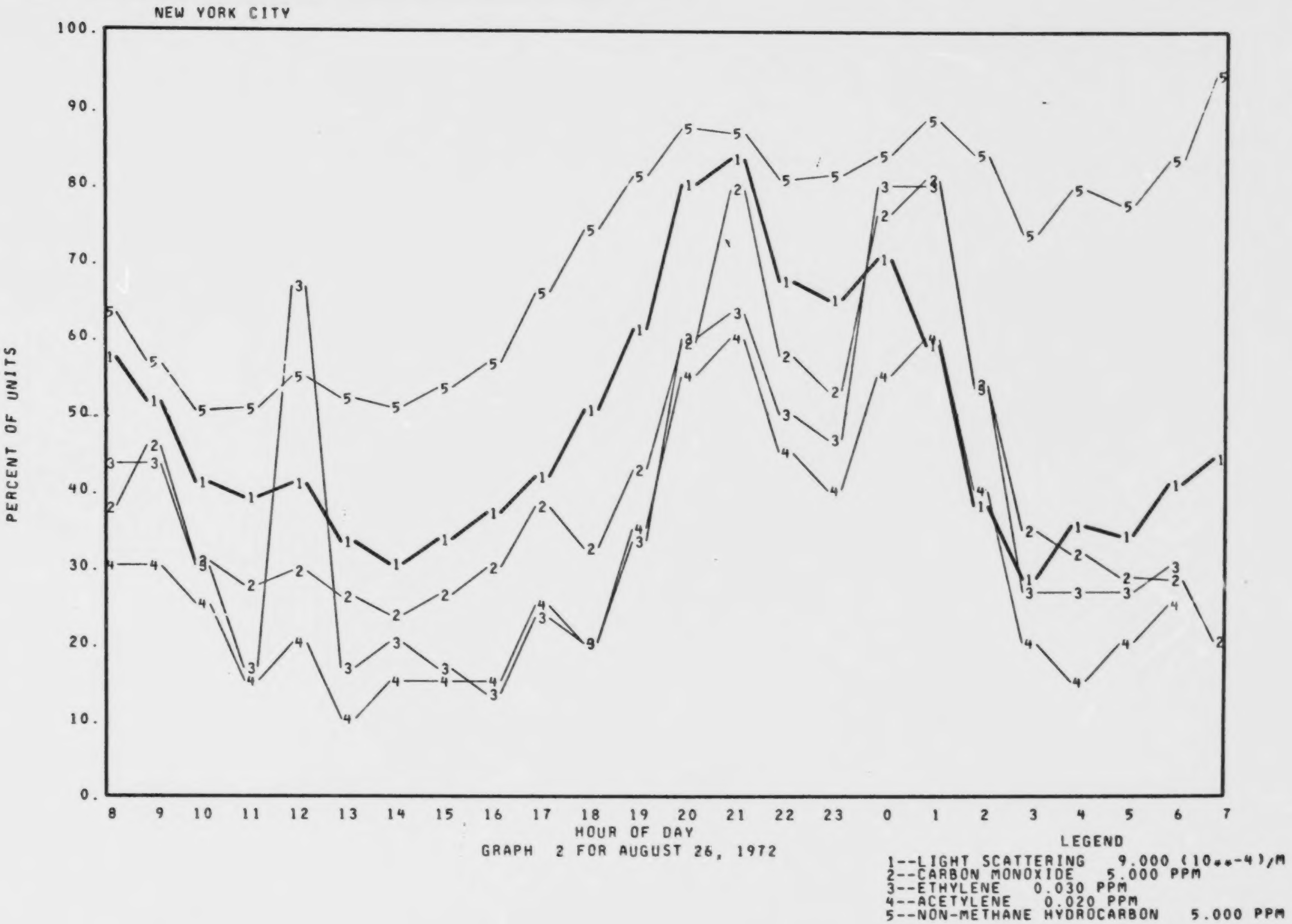
 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                       0.187
 7--WIND SPEED (MPH)                                        2.483
 8--WIND DIRECTION (DEGREES)                              147.573
 9--TEMPERATURE (CENTIGRADE)                               25.030
10--RELATIVE HUMIDITY (PERCENT)                            75.764
11--LIGHT SCATTERING ((10**-4)/M)                           4.363
12--SULFUR DIOXIDE (PPM)                                    0.012
13--OZONE (PPM)                                             0.049
14--NITRIC OXIDE (PPM)                                      0.027
15--NITROGEN DIOXIDE (PPM)                                  0.062
16--NITROGEN OXIDES (PPM)                                   0.086
17--CARBON MONOXIDE (PPM)                                   2.070
18--METHANE (PPM)                                           2.076
19--TOTAL HYDROCARBON (PPM)                                 5.641
20--ETHYLENE (PPM)                                          0.012
21--ACETYLENE (PPM)                                         0.006
30--NON-METHANE HYDROCARBON (PPM)                           3.565


            SUBSTANCE                              MAX CONCENTRATION  HOUR  FOR AUGUST 26, 1972

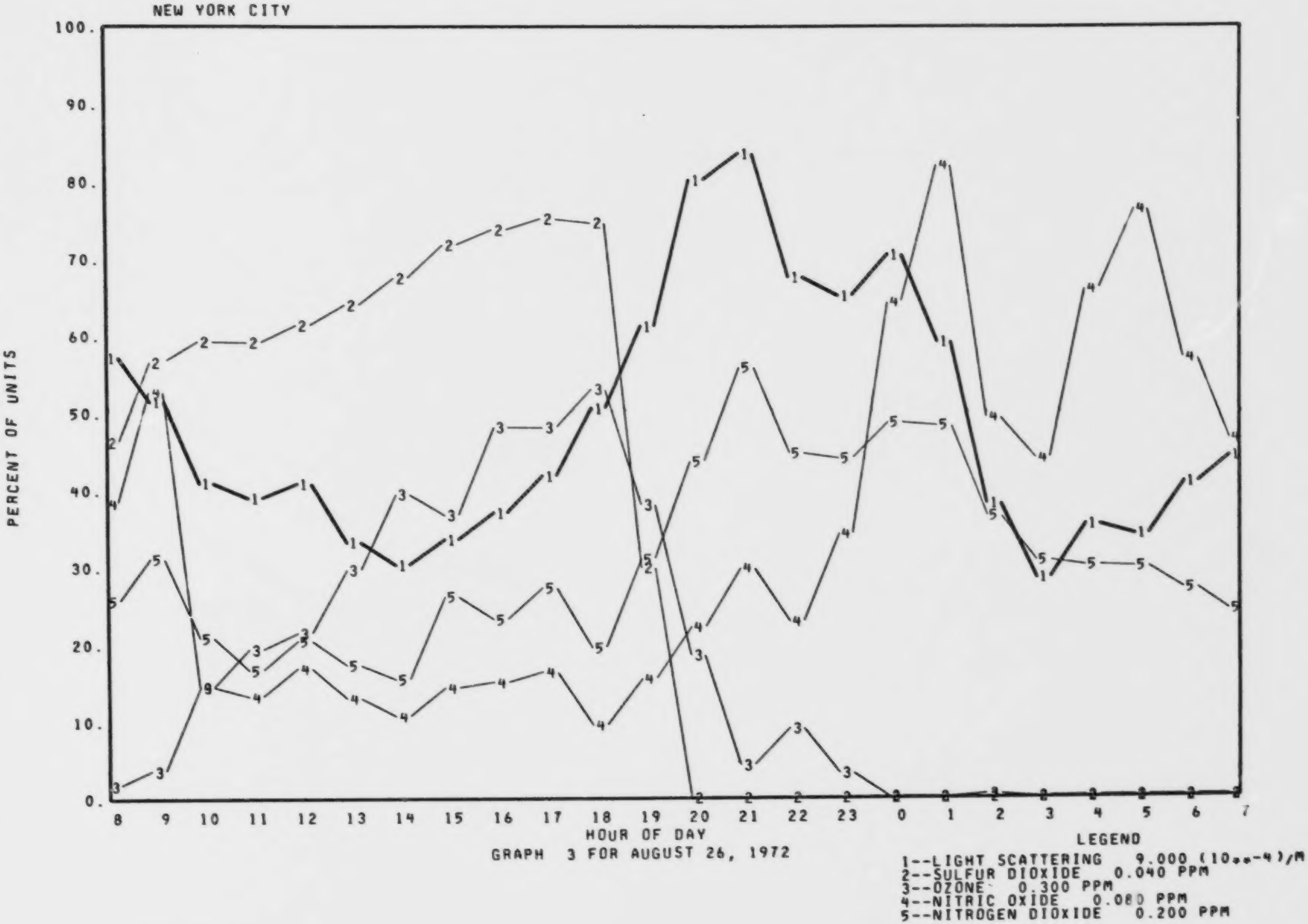

11--LIGHT SCATTERING ((10**-4)/M)                     7.520         21
12--SULFUR DIOXIDE (PPM)                              0.030         17
13--OZONE (PPM)                                       0.159         18
14--NITRIC OXIDE (PPM)                                0.066          1
15--NITROGEN DIOXIDE (PPM)                            0.112         21
16--NITROGEN OXIDES (PPM)                             0.156          1
17--CARBON MONOXIDE (PPM)                             4.043          1
20--ETHYLENE (PPM)                                    0.024          0
                                                                     1
21--ACETYLENE (PPM)                                   0.012         21
                                                                     1
30--NON-METHANE HYDROCARBON (PPM)                     4.724          7
```



GRAPH 1 FOR AUGUST 26, 1972



GRAPH 2 FOR AUGUST 26, 1972



GRAPH 3 FOR AUGUST 26, 1972

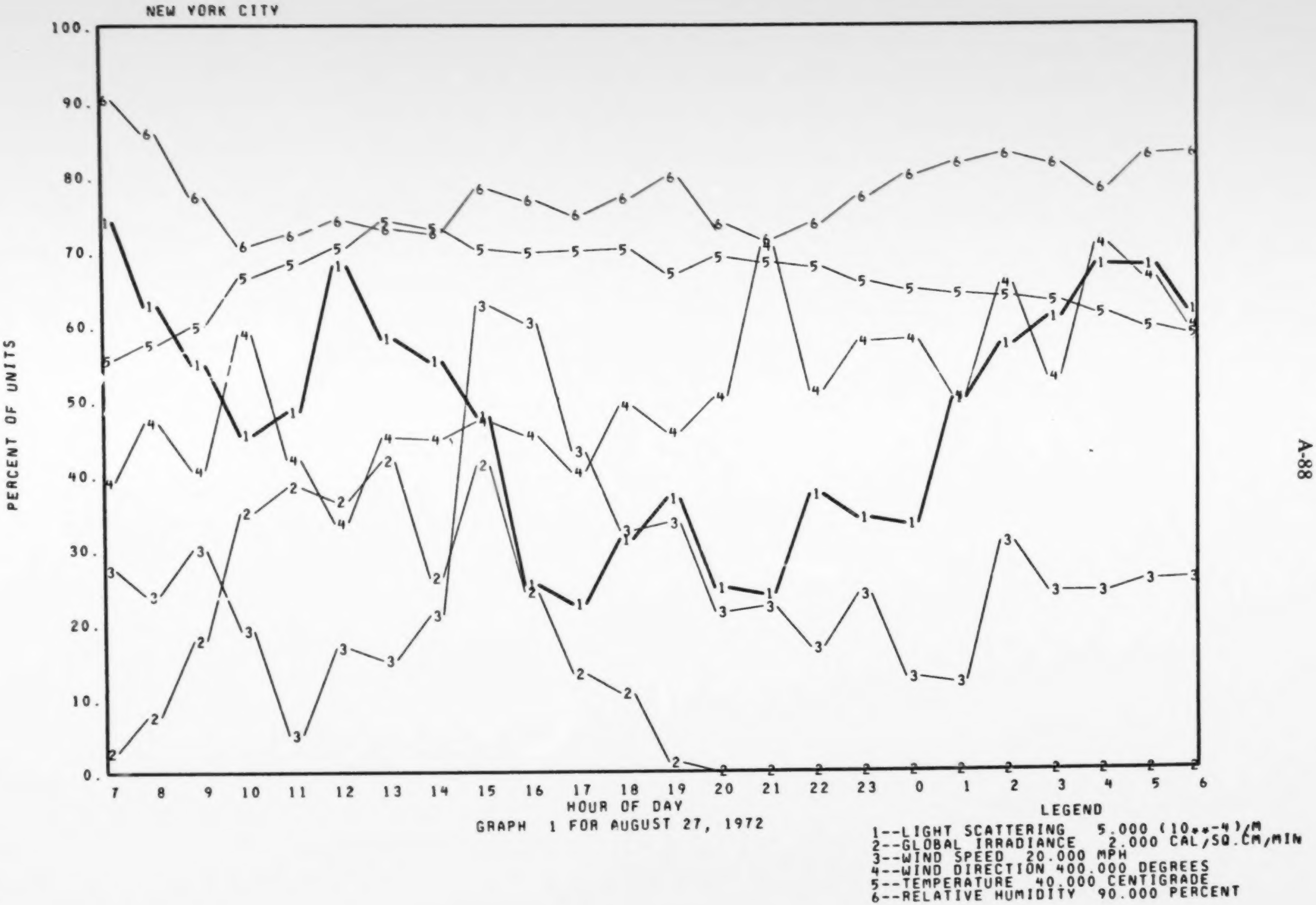
```
        SUBSTANCE                            AVERAGE FOR AUGUST 27, 1972


 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                   0.246
 7--WIND SPEED (MPH)                                    5.216
 8--WIND DIRECTION (DEGREES)                          204.756
 9--TEMPERATURE (CENTIGRADE)                           26.263
10--RELATIVE HUMIDITY (PERCENT)                        69.963
11--LIGHT SCATTERING ((10**-4)/M)                       2.388
12--SULFUR DIOXIDE (PPM)                                0.019
13--OZONE (PPM)                                         0.049
14--NITRIC OXIDE (PPM)                                  0.010
15--NITROGEN DIOXIDE (PPM)                              0.030
16--NITROGEN OXIDES (PPM)                               0.040
17--CARBON MONOXIDE (PPM)                               0.458
18--METHANE (PPM)                                       0.915
19--TOTAL HYDROCARBON (PPM)                             4.314
20--ETHYLENE (PPM)                                      0.005
21--ACETYLENE (PPM)                                     0.002
30--NON-METHANE HYDROCARBON (PPM)                       3.399

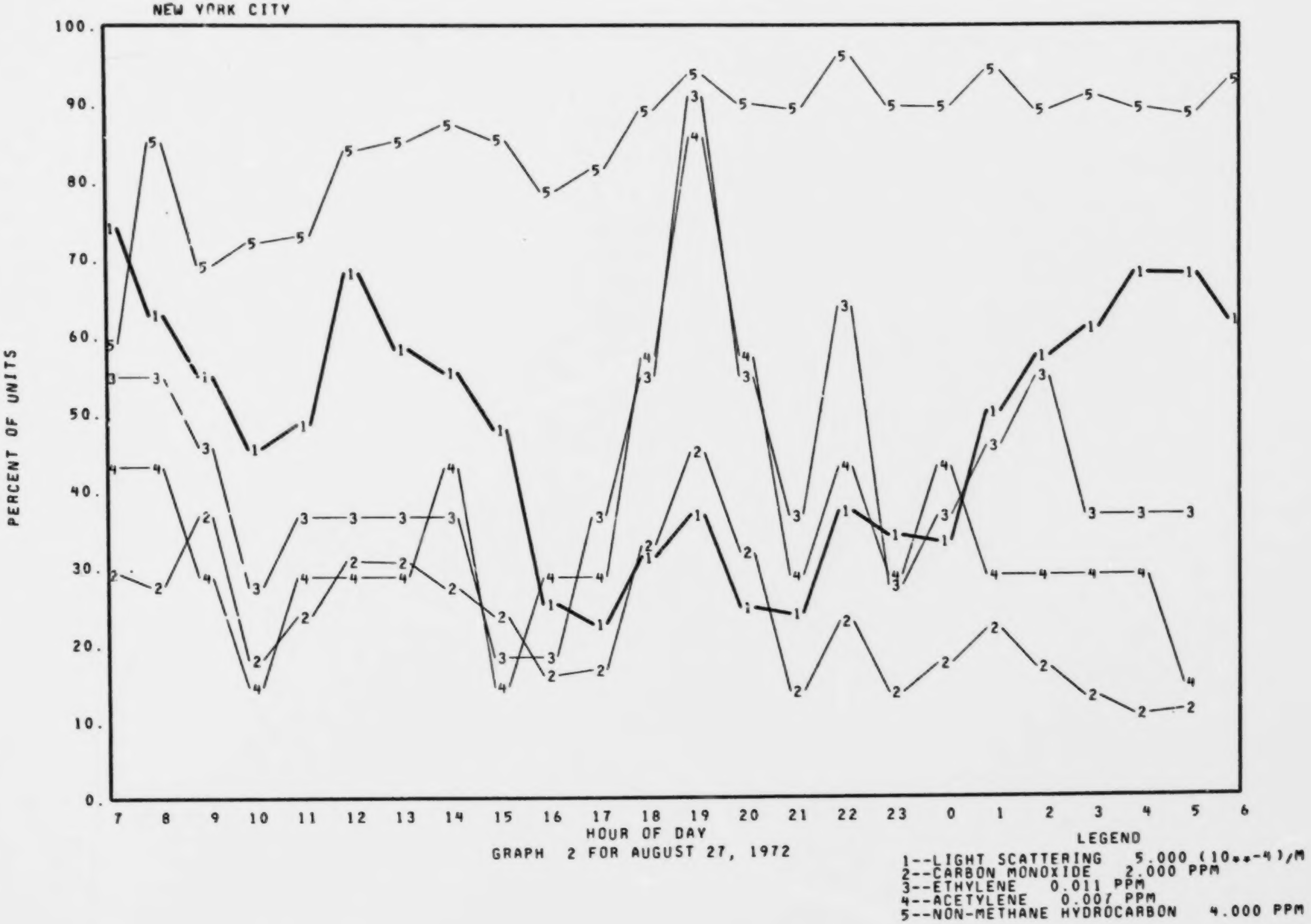


        SUBSTANCE                            MAX CONCENTRATION  HOUR  FOR AUGUST 27, 1972


11--LIGHT SCATTERING ((10**-4)/M)                   3.695          7
12--SULFUR DIOXIDE (PPM)                            0.026          1
13--OZONE (PPM)                                     0.151         15
14--NITRIC OXIDE (PPM)                              0.030          1
15--NITROGEN DIOXIDE (PPM)                          0.045         22
16--NITROGEN OXIDES (PPM)                           0.069         22
17--CARBON MONOXIDE (PPM)                           0.897         19
20--ETHYLENE (PPM)                                  0.010         19
21--ACETYLENE (PPM)                                 0.006         19
30--NON-METHANE HYDROCARBON (PPM)                   3.840         22
```



GRAPH 1 FOR AUGUST 27, 1972



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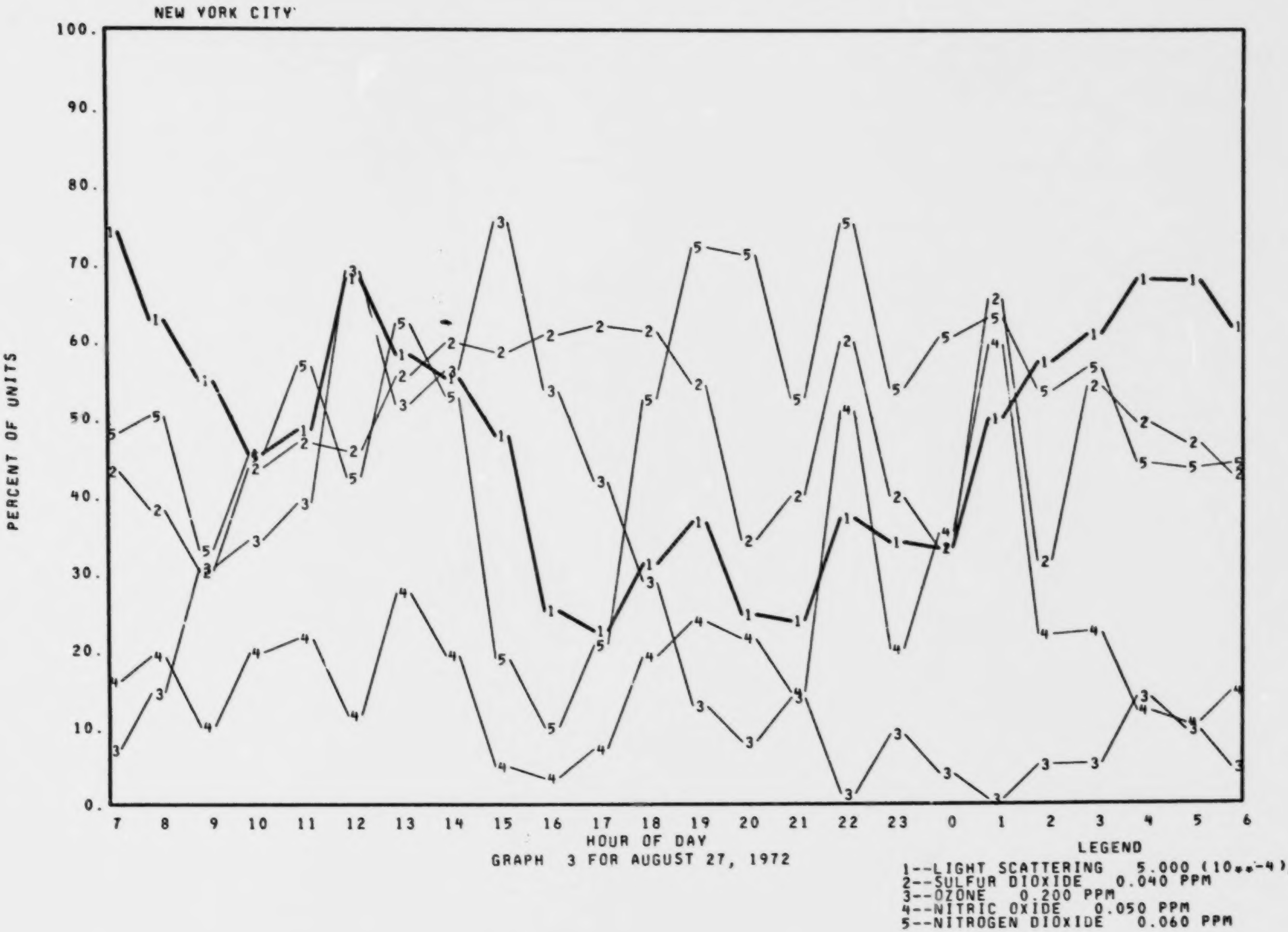
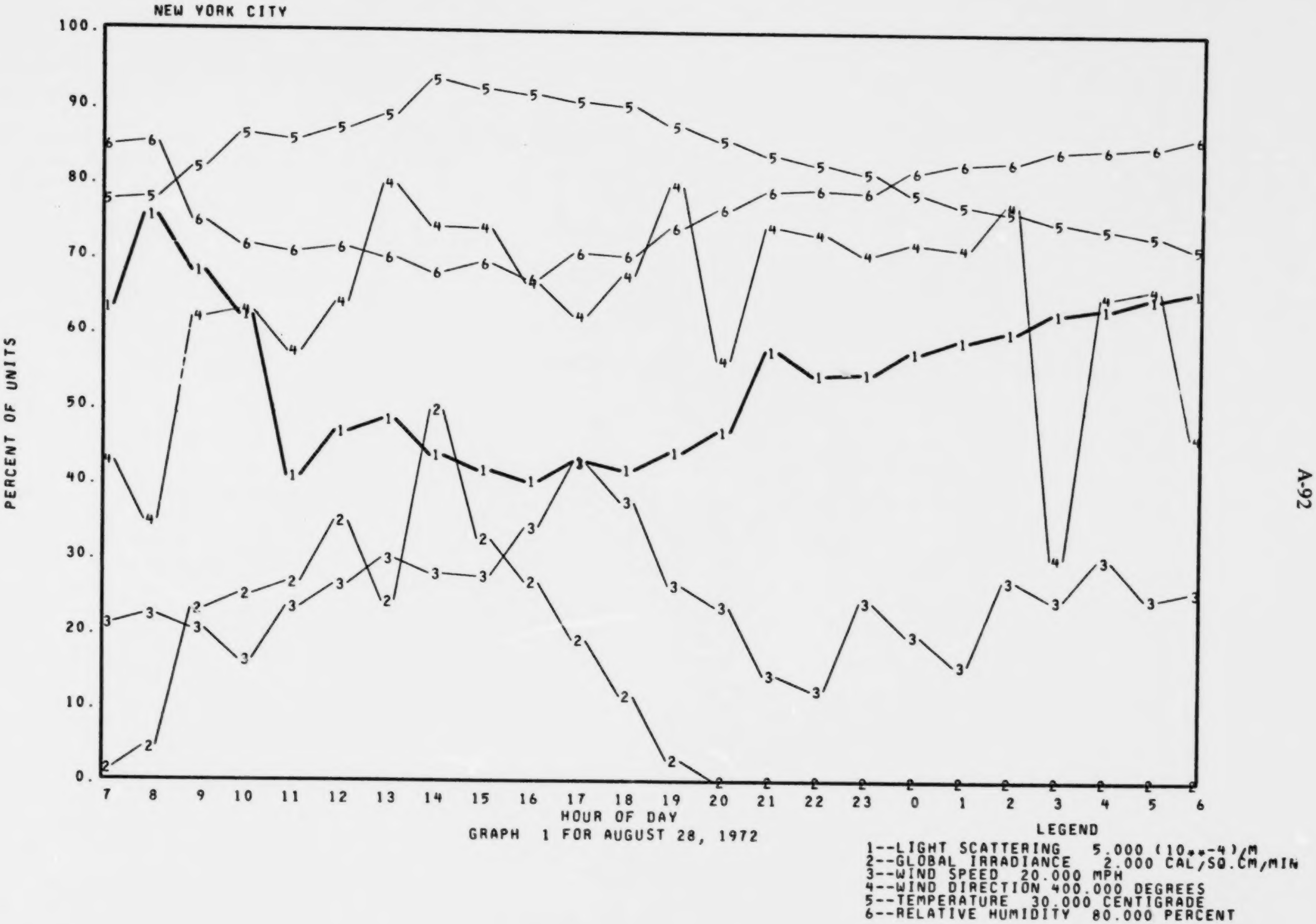


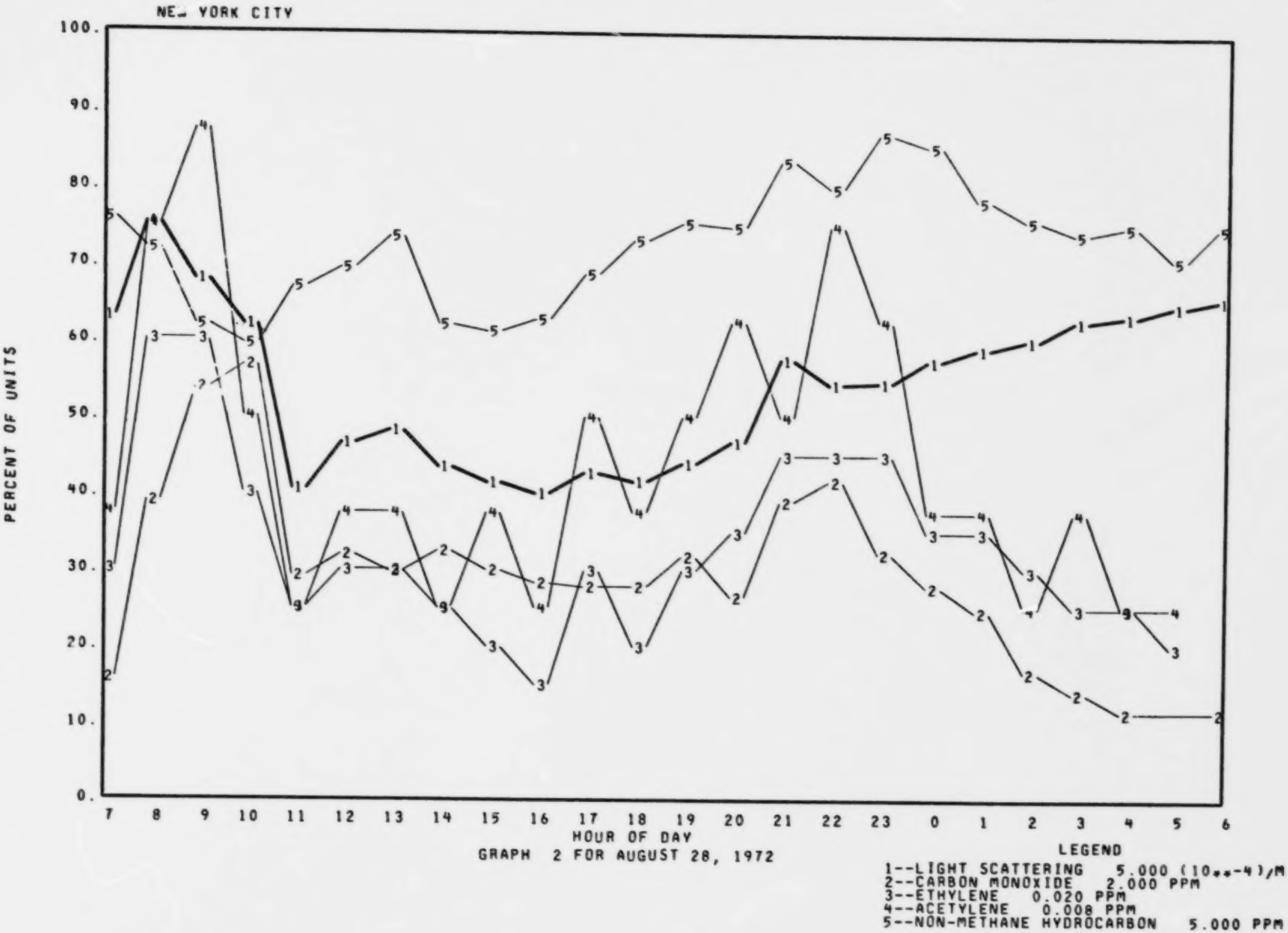
GRAPH 3 FOR AUGUST 27, 1972

| SUBSTANCE | AVERAGE FOR AUGUST 28, 1972 |
|---|---|
| 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN) | 0.233 |
| 7--WIND SPEED (MPH) | 4.935 |
| 8--WIND DIRECTION (DEGREES) | 254.292 |
| 9--TEMPERATURE (CENTIGRADE) | 24.844 |
| 10--RELATIVE HUMIDITY (PERCENT) | 61.526 |
| 11--LIGHT SCATTERING ((10**-4)/M) | 2.712 |
| 12--SULFUR DIOXIDE (PPM) | 0.025 |
| 13--OZONE (PPM) | 0.027 |
| 14--NITRIC OXIDE (PPM) | 0.023 |
| 15--NITROGEN DIOXIDE (PPM) | 0.026 |
| 16--NITROGEN OXIDES (PPM) | 0.053 |
| 17--CARBON MONOXIDE (PPM) | 0.591 |
| 18--METHANE (PPM) | 0.954 |
| 19--TOTAL HYDROCARBON (PPM) | 4.582 |
| 20--ETHYLENE (PPM) | 0.007 |
| 21--ACETYLENE (PPM) | 0.004 |
| 30--NON-METHANE HYDROCARBON (PPM) | 3.628 |

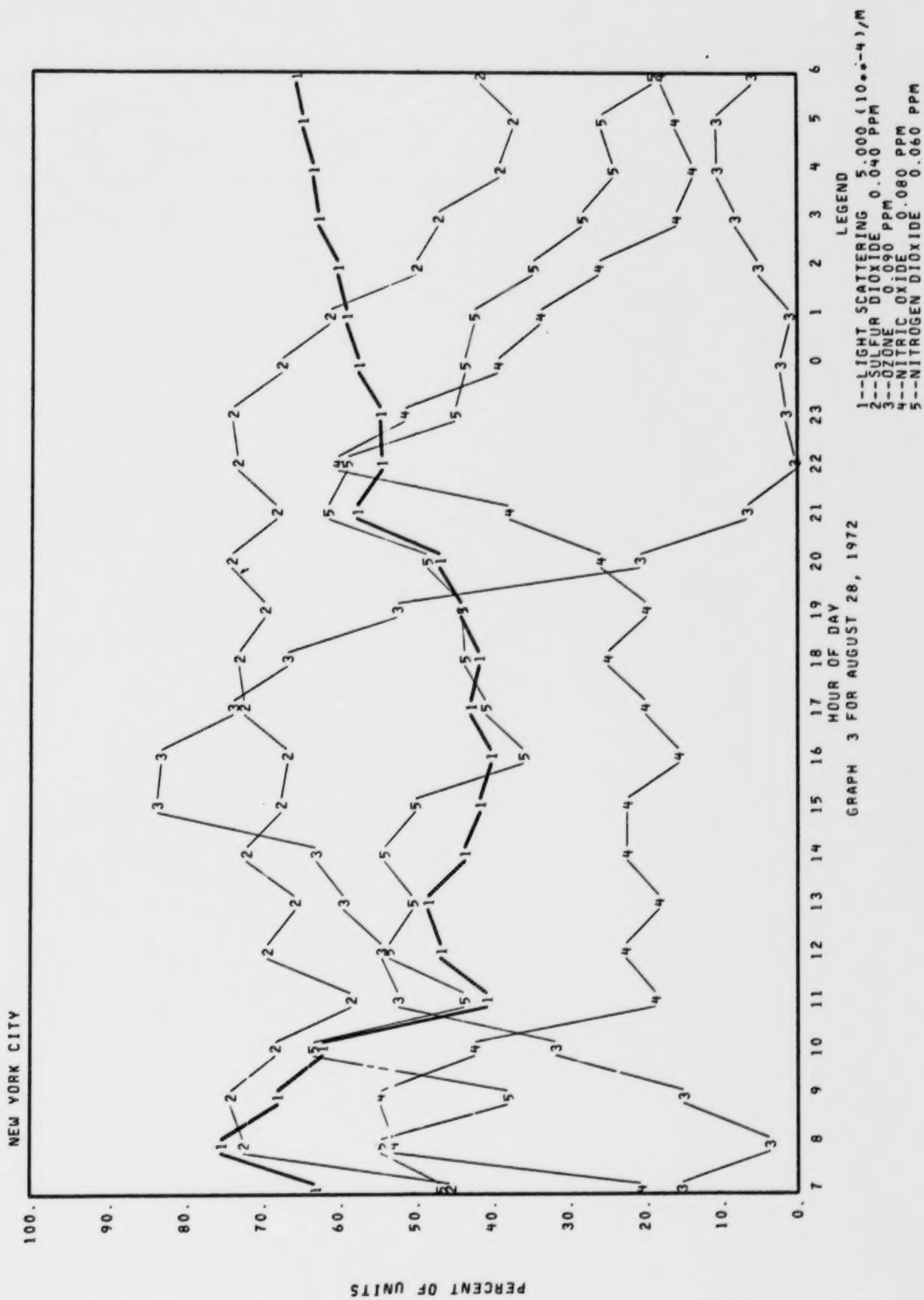
| SUBSTANCE | MAX CONCENTRATION | HOUR FOR AUGUST 28, 1972 |
|---|---|---|
| 11--LIGHT SCATTERING ((10**-4)/M) | 3.757 | 8 |
| 12--SULFUR DIOXIDE (PPM) | 0.030 | 9 |
| 13--OZONE (PPM) | 0.075 | 15 |
| 14--NITRIC OXIDE (PPM) | 0.048 | 22 |
| 15--NITROGEN DIOXIDE (PPM) | 0.038 | 10 |
| 16--NITROGEN OXIDES (PPM) | 0.086 | 22 |
| 17--CARBON MONOXIDE (PPM) | 1.133 | 10 |
| 20--ETHYLENE (PPM) | 0.012 | 8 |
|  |  | 9 |
| 21--ACETYLENE (PPM) | 0.007 | 9 |
| 30--NON-METHANE HYDROCARBON (PPM) | 4.350 | 23 |



GRAPH 1 FOR AUGUST 28, 1972



GRAPH 2 FOR AUGUST 28, 1972



GRAPH 3 FOR AUGUST 28, 1972

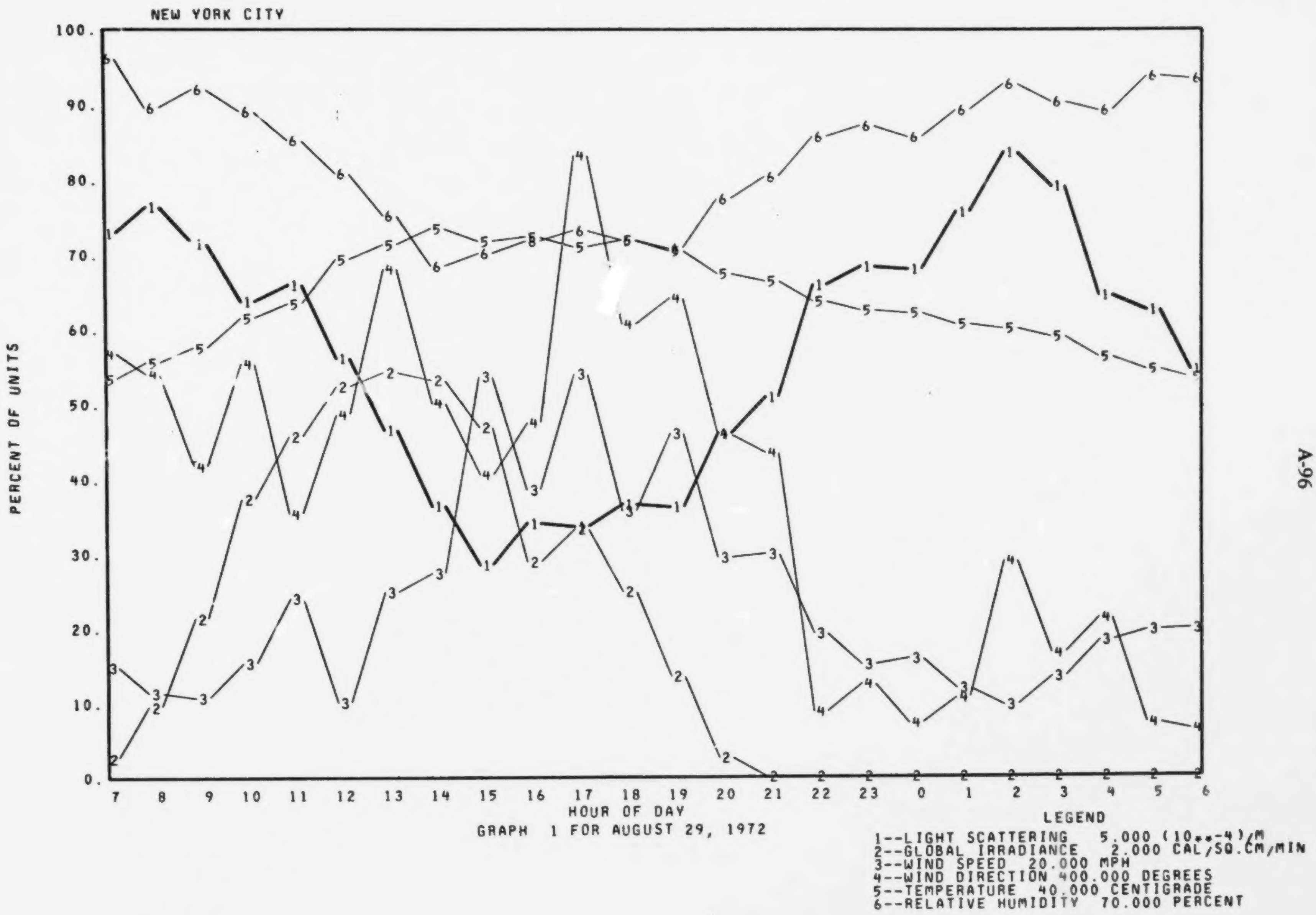
```
          SUBSTANCE                          AVERAGE FOR AUGUST 29, 1972


  6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                  0.355
  7--WIND SPEED (MPH)                                   4.726
  8--WIND DIRECTION (DEGREES)                         152.276
  9--TEMPERATURE (CENTIGRADE)                          25.467
 10--RELATIVE HUMIDITY (PERCENT)                       58.309
 11--LIGHT SCATTERING ((10**-4)/M)                      2.868
 12--SULFUR DIOXIDE (PPM)                               0.025
 13--OZONE (PPM)                                        0.035
 14--NITRIC OXIDE (PPM)                                 0.036
 15--NITROGEN DIOXIDE (PPM)                             0.022
 16--NITROGEN OXIDES (PPM)                              0.063
 17--CARBON MONOXIDE (PPM)                              0.519
 18--METHANE (PPM)                                      0.906
 19--TOTAL HYDROCARBON (PPM)                            4.466
 20--ETHYLENE (PPM)                                     0.007
 21--ACETYLENE (PPM)                                    0.003
 30--NON-METHANE HYDROCARBON (PPM)                      3.560

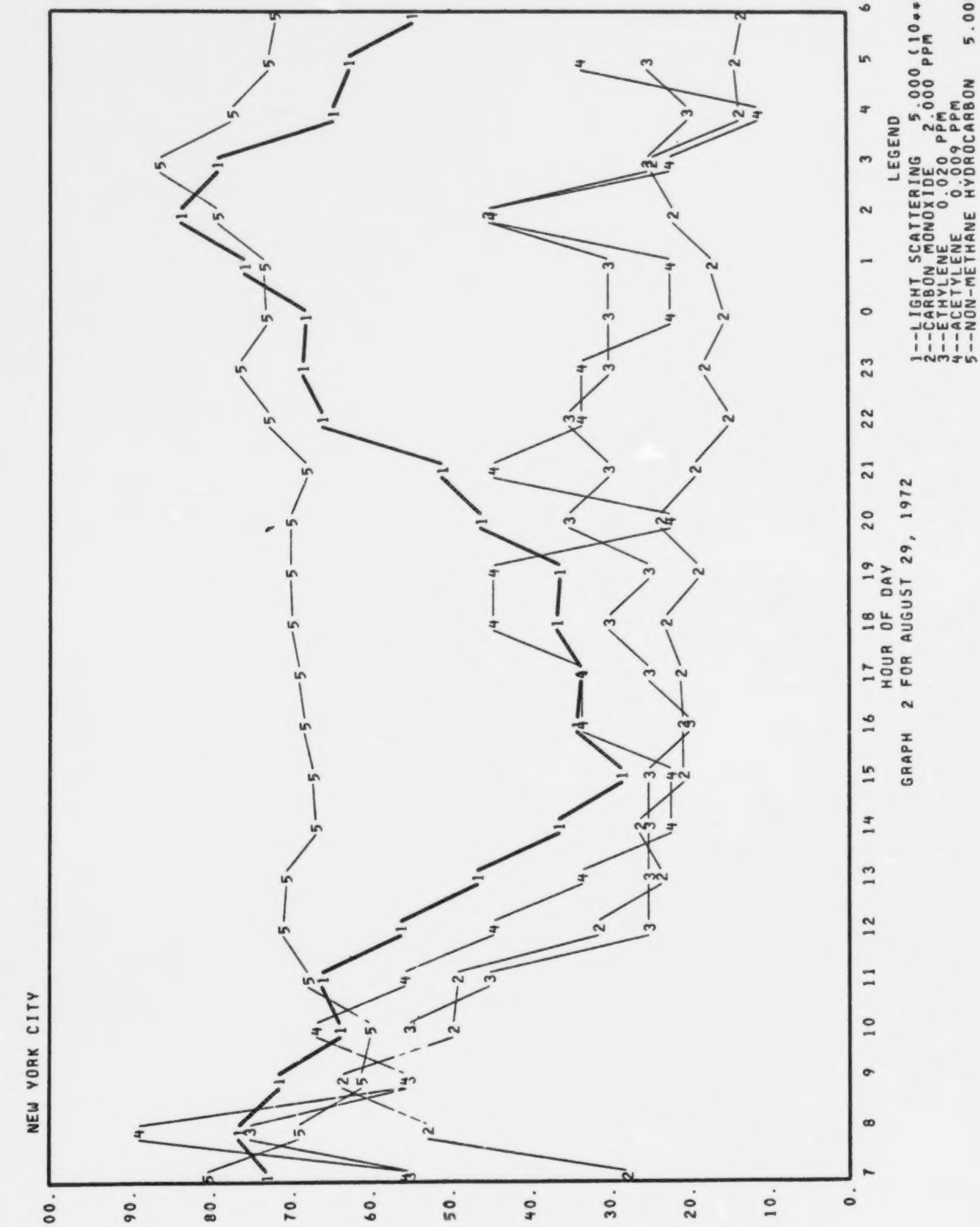


          SUBSTANCE                          MAX CONCENTRATION  HOUR  FOR AUGUST 29, 1972

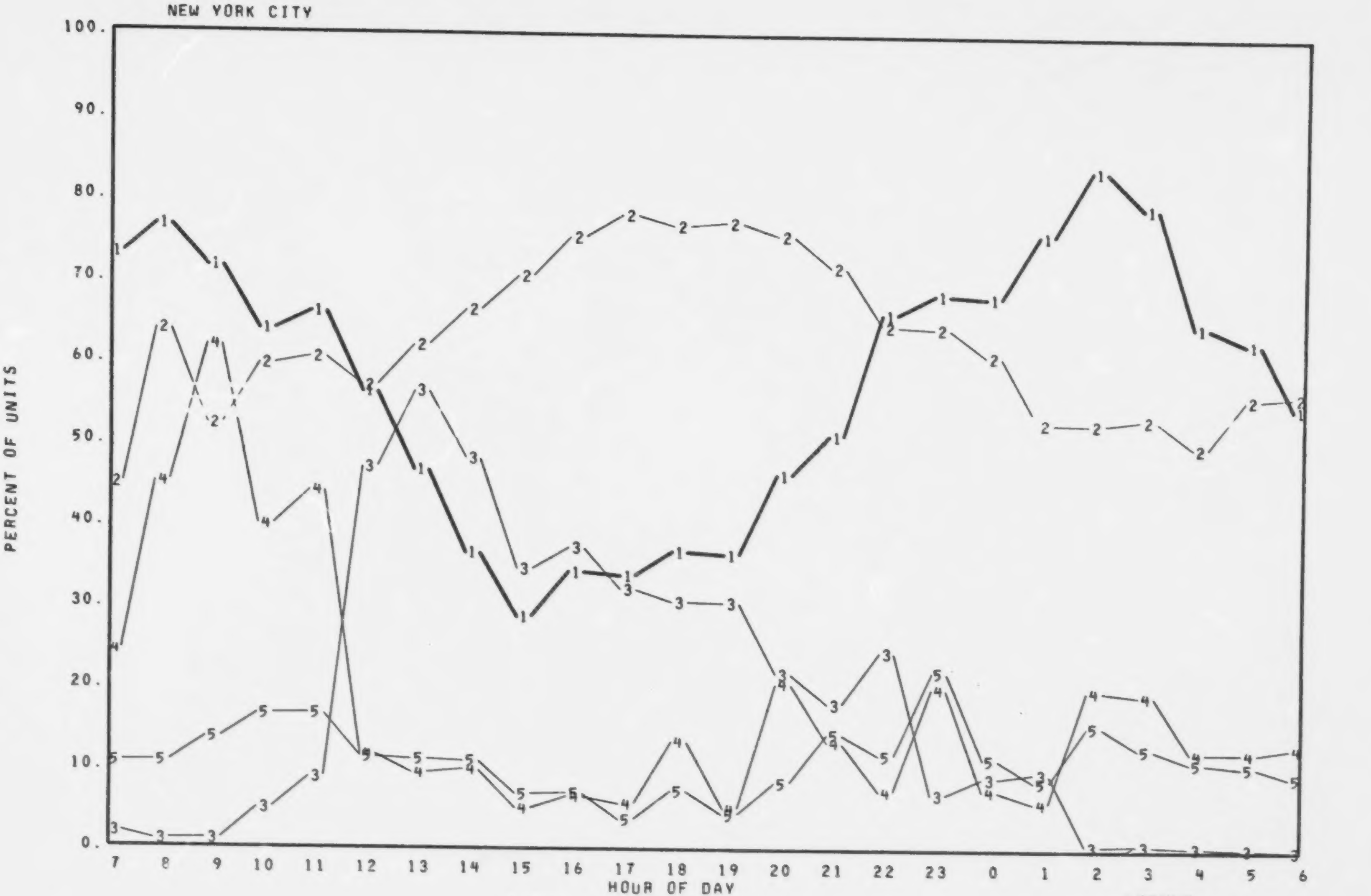

 11--LIGHT SCATTERING ((10**-4)/M)                4.183         2
 12--SULFUR DIOXIDE (PPM)                         0.031        17
 13--OZONE (PPM)                                  0.112        13
 14--NITRIC OXIDE (PPM)                           0.123         9
 15--NITROGEN DIOXIDE (PPM)                       0.044        23
 16--NITROGEN OXIDES (PPM)                        0.152         9
 17--CARBON MONOXIDE (PPM)                        1.269         9
 20--ETHYLENE (PPM)                               0.015         8
 21--ACETYLENE (PPM)                              0.008         8
 30--NON-METHANE HYDROCARBON (PPM)                4.317         3
```



GRAPH 1 FOR AUGUST 29, 1972



GRAPH 2 FOR AUGUST 29, 1972



GRAPH 3 FOR AUGUST 29, 1972

```
          SUBSTANCE                          AVERAGE FOR AUGUST 30, 1972

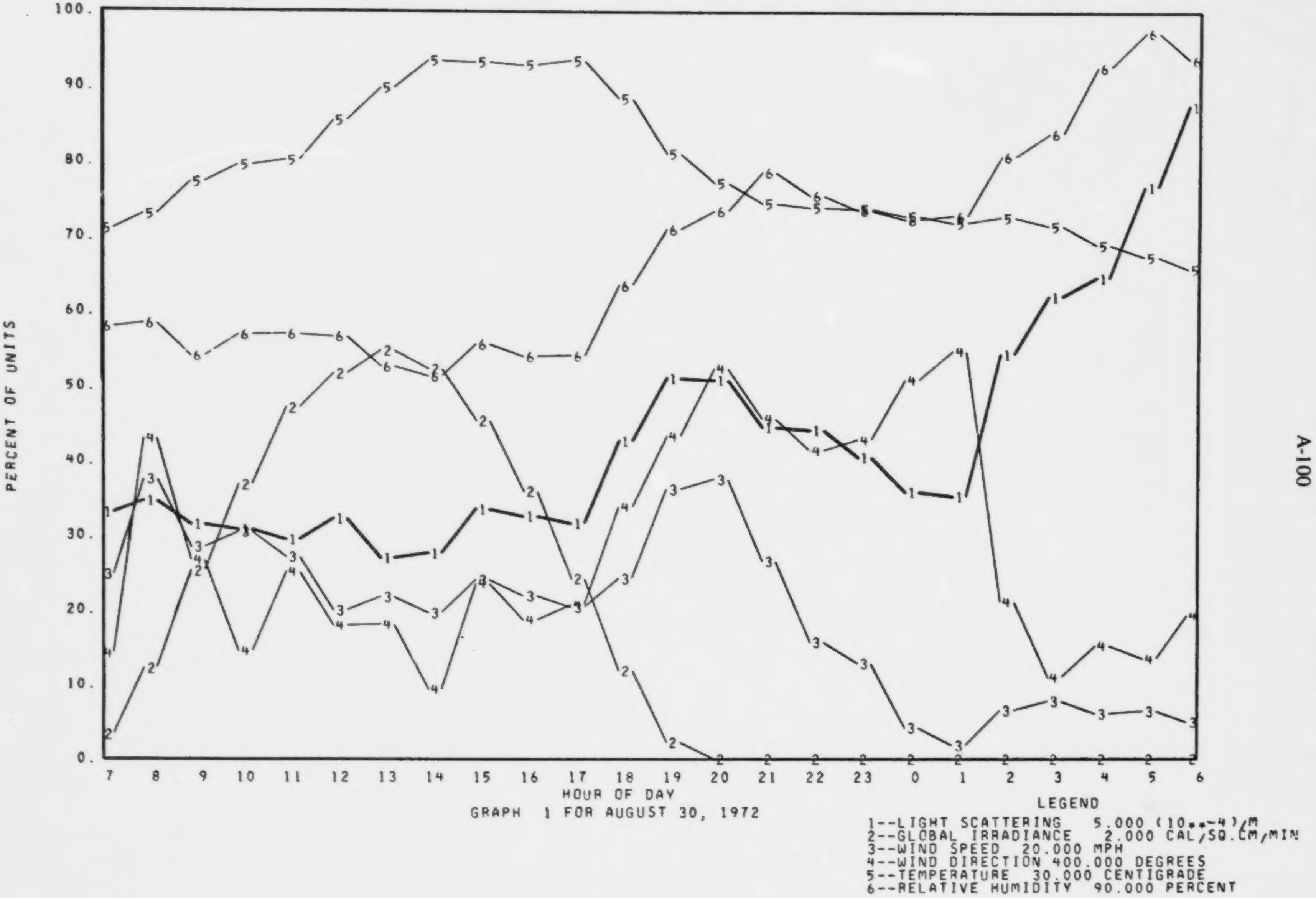

 6--GLOBAL IRRADIANCE (CAL/SQ.CM/MIN)                  0.335
 7--WIND SPEED (MPH)                                   3.876
 8--WIND DIRECTION (DEGREES)                         112.479
 9--TEMPERATURE (CENTIGRADE)                          23.581
10--RELATIVE HUMIDITY (PERCENT)                       61.329
11--LIGHT SCATTERING ((10**-4)/M)                      2.151
12--SULFUR DIOXIDE (PPM)                               0.025
13--OZONE (PPM)                                        0.029
14--NITRIC OXIDE (PPM)                                 0.052
15--NITROGEN DIOXIDE (PPM)                             0.020
16--NITROGEN OXIDES (PPM)                              0.077
17--CARBON MONOXIDE (PPM)                              0.532
18--METHANE (PPM)                                      0.969
19--TOTAL HYDROCARBON (PPM)                            4.380
20--ETHYLENE (PPM)                                     0.009
21--ACETYLENE (PPM)                                    0.004
30--NON-METHANE HYDROCARBON (PPM)                      3.412



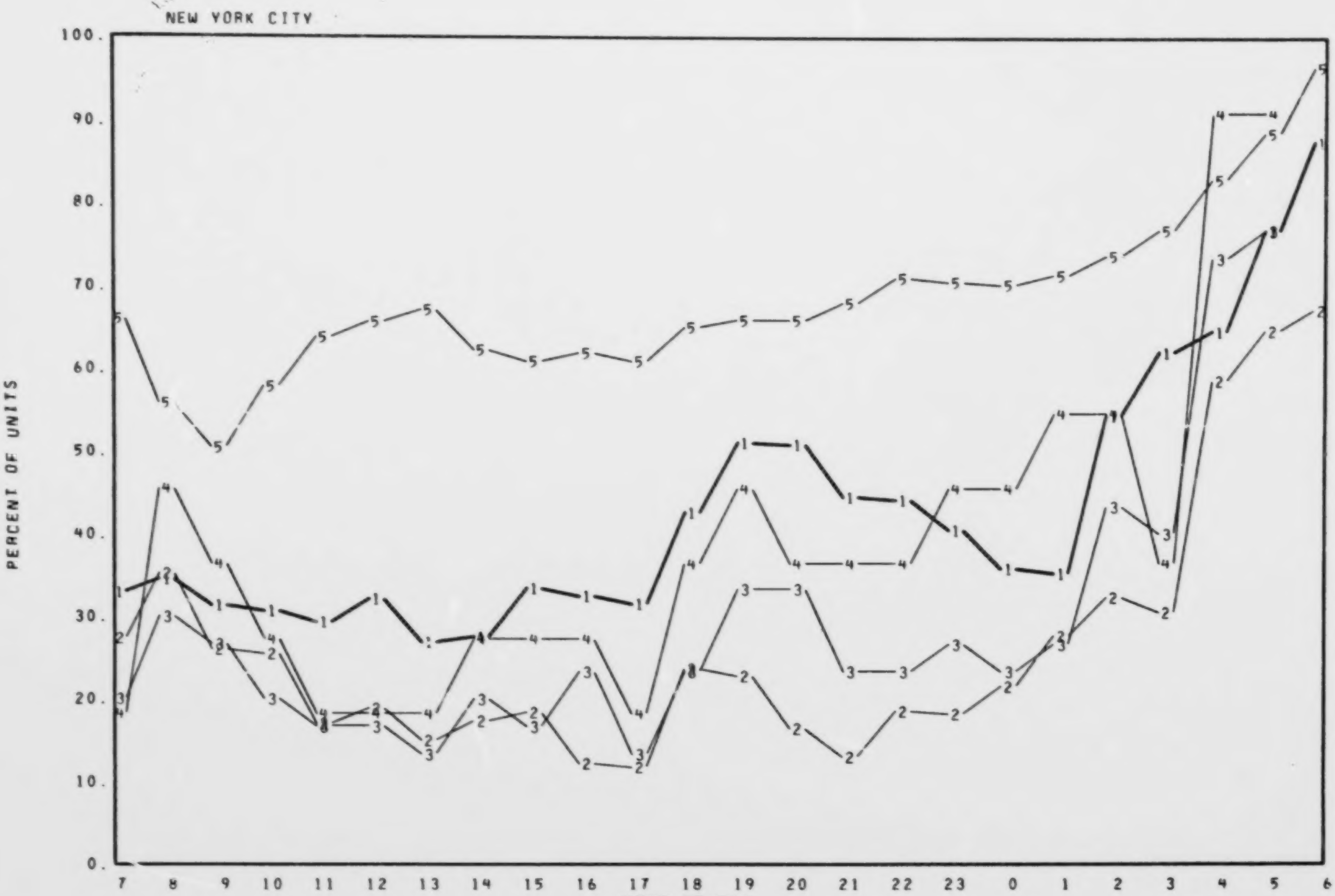
          SUBSTANCE                          MAX CONCENTRATION  HOUR  FOR AUGUST 30, 1972


11--LIGHT SCATTERING ((10**-4)/M)                  4.373          6
12--SULFUR DIOXIDE (PPM)                           0.032         18
13--OZONE (PPM)                                    0.104         16
14--NITRIC OXIDE (PPM)                             0.195          6
15--NITROGEN DIOXIDE (PPM)                         0.029         19
16--NITROGEN OXIDES (PPM)                          0.227          6
17--CARBON MONOXIDE (PPM)                          1.340          6
20--ETHYLENE (PPM)                                 0.023          5
21--ACETYLENE (PPM)                                0.010          4
                                                                  5
30--NON-METHANE HYDROCARBON (PPM)                  4.818          6
```

NEW YORK CITY

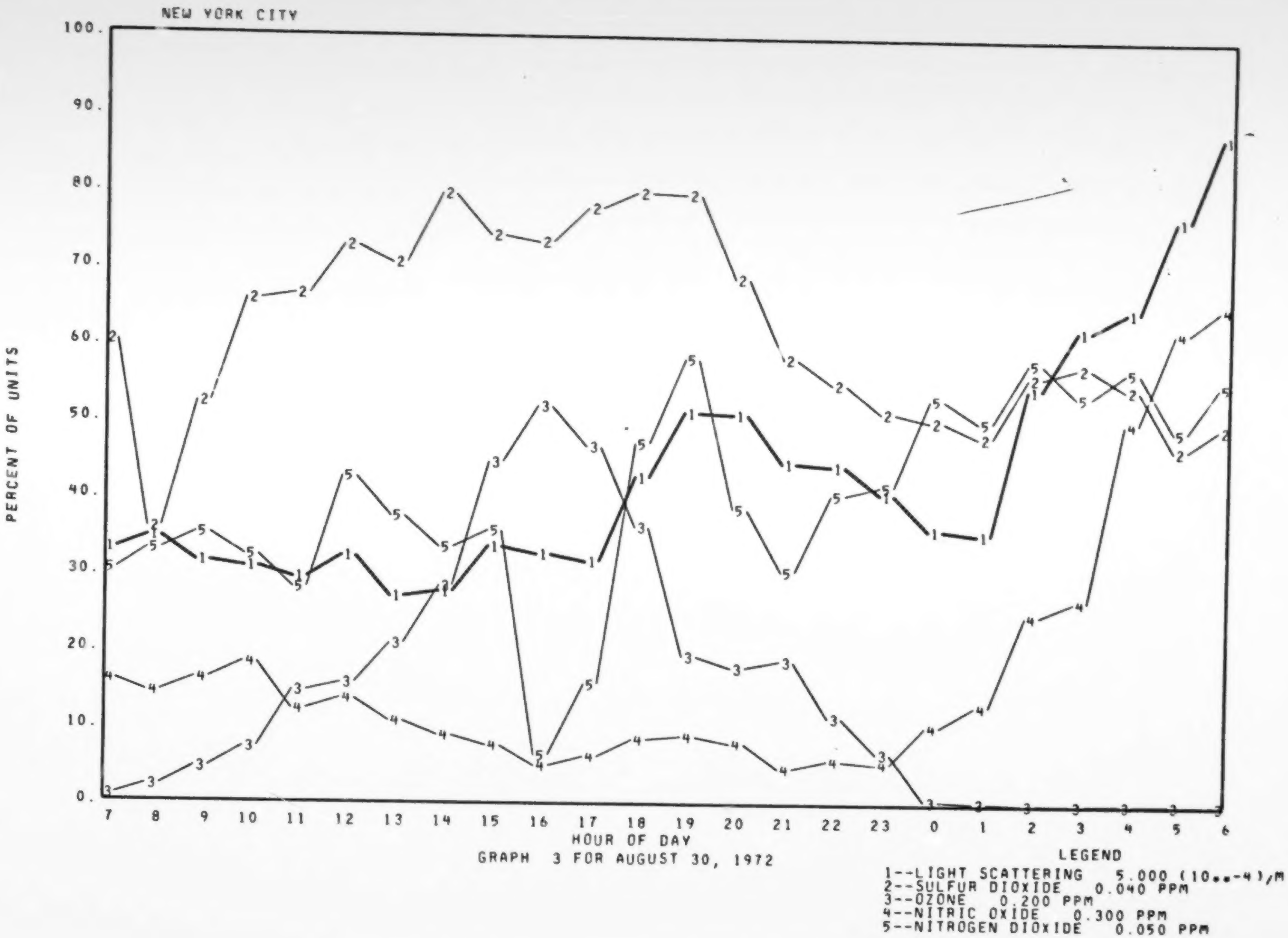


GRAPH 1 FOR AUGUST 30, 1972



GRAPH 2 FOR AUGUST 30, 1972

LEGEND
1--LIGHT SCATTERING 5.000 (10**-4)/M
2--CARBON MONOXIDE 2.000 PPM
3--ETHYLENE 0.030 PPM
4--ACETYLENE 0.011 PPM
5--NON-METHANE HYDROCARBON 5.000 PPM



GRAPH 3 FOR AUGUST 30, 1972

Sampling Site: Pomona, California

Sampling Per[illegible]: November 10, through November 19, 1972

Comments:

(1) The first 4 days of sampling were extremely clear (Nov. 10-13). It rained during two of the next three days (Nov. 14 and 16) followed by 3 days of some what hazy conditions.

(2) Air quality data furnished by the County of Los Angeles Air Pollution Control District. Sampling days are bracketted in the accompanying tables.

JOB NUMBER =SAMU4A
PROGRAM =SAMUPA01
DATE: 12/28/72

AIR POLLUTION CONTROL DISTRICT - COUNTY OF LOS ANGELES — NO. 16

SULFUR DIOXIDE / HOURLY AVERAGE / IN PPHM — STATION 75 — 11 / 1972

| DAY | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | AVE. | N | 1HR MAX | INSTANT. HR | INSTANT. MAX |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | <------ | | | | | | | | | | | | | HOUR PST | | | | | | | | | | ------> | | | | | |
| 01 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 3 | 5 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 1.9 | 24 | 5 | 15 | 5 |
| 02 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 2 | 3 | 3 | 2 | 1 | 2 | 1 | 2 | 2 | 4 | 6 | 4 | 4 | 3 | 3 | 3 | 2 | 2.4 | 24 | 6 | 17 | 6 |
| 03 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 4 | 7 | 8 | 6 | 6 | 5 | 5 | 4 | 2.9 | 24 | 8 | 16 | 8 |
| 04* | 3 | 3 | 2 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 | 1.6 | 24 | 3 | 1 | 4 |
| 05* | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1.1 | 24 | 3 | 17 | 4 |
| 06 | 1 | -1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1.2 | 24 | 3 | 10 | 3 |
| 07 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1.2 | 24 | 3 | 6 | 3 |
| 08 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.0 | 24 | 1 | 17 | 1 |
| 09 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1.2 | 24 | 3 | 17 | 4 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.3 | 24 | 3 | 11 | 3 |
| 11* | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.0 | 24 | 1 | 11 | 1 |
| 12* | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.0 | 24 | 1 | 20 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 1.2 | 23 | 2 | 21 | 2 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.0 | 24 | 1 | 19 | 2 |
| 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.0 | 24 | 1 | 15 | 1 |
| 16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.0 | 24 | 1 | 10 | 1 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1.4 | 23 | 2 | 20 | 2 |
| 18* | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 1.5 | 24 | 3 | 17 | 3 |
| 19* | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1.4 | 24 | 3 | 16 | 3 |
| 20 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 5 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2.3 | 24 | 3 | 17 | 4 |
| 21 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 1.8 | 24 | 3 | 20 | 3 |
| 22 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1.6 | 24 | 2 | 7 | 3 |
| 23 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2.0 | 24 | 3 | 15 | 4 |
| 24 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 1.5 | 24 | 2 | 6 | 2 |
| 25* | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 1.6 | 24 | 2 | 9 | 3 |
| 26* | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2.0 | 24 | 3 | 17 | 3 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1.9 | 24 | 3 | 17 | 4 |
| 28 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1.8 | 24 | 3 | 8 | 3 |
| 29 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1.4 | 24 | 3 | 6 | 3 |
| 30* | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 1.4 | 24 | 3 | 16 | 3 |
| AVE | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1.5 | | 3 | | 3 |
| N | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 29 | 29 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | | 718 | 30 | | 30 |
| MAX | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 5 | 4 | 7 | 8 | 6 | 6 | 5 | 5 | 4 | 2.9 | | 8 | | 8 |

*WEEKEND OR HOLIDAY. **INSUFFICIENT DATA FOR DAY TO DETERMINE A MAXIMUM.

JOB NUMBER [illegible]
PROGRAM [illegible]
DATE: 12/26/72

AIR POLLUTION CONTROL DISTRICT - COUNTY OF LOS ANGELES

NO. 2.

NITRIC OXIDE - DIRECT READOUT OF NO / HOURLY AVERAGE / IN PPHM   STATION 75   11 / 1972

| DAY | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | AVE. | N | 1HR MAX | INSTANT. HR | INSTANT. MAX |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 37 | 21 | 12 | 9 | 13 | 14 | 21 | 40 | 24 | 12 | 6 | 5 |  | 4 | 5 | 8 | 7 | 11 | 17 | 21 | 21 | 35 | 47 | 44 | 18.9 | 23 | 47 | 22 | 5[illegible] |
| 02 | 38 | 23 | 24 | 27 | 25 | 22 | 22 | 24 | 27 | 9 | 4 | 4 |  | 3 | 3 | 4 | 5 | 14 | 32 | 48 | 31 | 56 | 60 | 55 | 24.4 | 23 | 60 | 21 | 7[illegible] |
| 03 | 32 | 39 | 29 | 23 | 26 | 20 | 18 | 22 | 27 |  | 6 | 4 |  | 3 | 2 | 2 | 4 | 8 | 10 | 11 | 16 | 23 | 36 | 25 | 18.5 | 22 | 52 | 0 | 52 |
| 04* | 36 | 30 | 8 | 1 | 2 | 1 | 4 | 6 | 2 | 3 | 2 | 3 |  | 4 | 5 | 4 | 14 | 22 | 10 | 14 | 16 | 14 | 9 | 15 | 9.8 | 23 | 36 | 0 | 45 |
| 05* | 9 | 6 | 11 | 9 | 8 | 7 | 5 | 6 | 3 | 2 | 1 | 2 |  | 2 | 2 | 2 | 2 | 3 | 9 | 19 | 33 | 28 | 36 | 34 | 10.4 | 23 | 36 | 23 | 42 |
| 06 | 18 | 8 | 11 | 12 | 16 | 14 | 26 | 23 | 16 | 13 | 7 | 4 |  |  |  |  |  |  |  |  |  |  |  |  | 14.0 | 12 | 26 | 6 | 36 |
| 07 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 08 |  |  |  |  |  |  |  |  |  |  |  |  |  | 4 | 4 | 5 | 6 | 13 | 14 | 21 | 29 | 28 | 19 | 17 | 14.6 | 11 | 29 | 0 | ** |
| 09 | 15 | 12 | 12 | 12 | 14 | 21 | 26 | 20 | 17 | 7 | 2 | 3 |  | 1 | 3 | 4 |  | 15 | 16 | 19 | 24 | 28 | 21 | 18 | 14.2 | 22 | 28 | 20 | 34 |
| 10 | 16 | 24 | 23 | 22 | 19 | 21 | 27 | 39 | 58 | 35 | 16 | 9 |  | 5 | 5 | 6 | 11 | 10 | 10 | 13 | 9 | 6 | 7 | 5 | 17.3 | 23 | 58 | 8 | 65 |
| 11* | 7 | 4 | 6 | 5 | 1 | 2 | 1 | 1 | 3 | 3 | 4 | 3 |  | 2 | 2 | 6 | 7 | 15 | 18 | 13 | 22 | 12 | 8 | 12 | 6.8 | 23 | 22 | 20 | 34 |
| 12* | 23 | 24 | 19 | 13 | 9 | 12 | 14 | 12 | 8 | 8 | 4 | 2 |  | 2 | 2 | 3 | 4 | 5 | 10 | 16 | 21 | 23 | 18 | 17 | 11.7 | 23 | 24 | 1 | 29 |
| 13 | 23 | 12 | 5 | 6 | 8 | 12 | 16 | 20 | 13 | 4 | 4 | 2 |  | 4 | 5 | 5 | 8 | 15 | 20 | 20 | 35 | 33 | 28 | 33 | 14.4 | 23 | 35 | 20 | 46 |
| 14 | 26 | 18 | 20 | 12 | 13 | 9 | 10 | 14 | 7 |  | 1 | 2 |  | 1 | 3 | 4 | 7 | 11 | 21 | 31 | 35 | 17 | 13 | 17 | 13.3 | 22 | 35 | 19 | 52 |
| 15 | 12 | 12 | 9 | 5 | 4 | 4 | 3 | 10 | 9 | 9 | 3 | 1 |  | 5 | 5 | 7 | 15 | 13 | 9 | 17 | 15 | 19 | 25 | 22 | 10.1 | 23 | 25 | 22 | 34 |
| 16 | 6 | 7 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |  | 1 | 5 | 5 | 15 | 17 | 10 | 7 | 12 | 4 | 2 | 3 | 4.7 | 23 | 17 | 16 | 2[illegible] |
| 17 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |  |  | 1 |  | 3 | 3 | 5 | 10 | 14 | 22 | 24 | 23 | 30 | 30 | 27 | 9.7 | 21 | 30 | 22 | 4[illegible] |
| 18* | 30 | 18 | 20 | 16 | 16 | 18 | 22 | 21 | 11 | 7 | 6 | 3 |  | 2 | 3 | 2 | 6 | 9 | 15 | 23 | 19 | 28 | 17 | 22 | 14.5 | 23 | 30 | 0 | 42 |
| 19* | 27 | 21 | 20 | 18 | 11 | 9 | 5 | 6 | 5 | 3 | 4 | 5 |  | 1 | 2 | 4 | 7 | 6 | 11 | 16 | 35 | 36 | 27 | 10 | 12.6 | 23 | 36 | 20 | 4[illegible] |
| 20 | 11 | 14 | 5 | 8 | 9 | 5 | 5 | 6 | 14 | 10 | 6 | 5 |  | 4 | 5 | 5 | 13 | 45 | 28 | 36 | 38 | 24 | 23 | 32 | 15.3 | 23 | 45 | 17 | 52 |
| 21 | 27 | 23 | 17 | 13 | 11 | 13 | 23 | 32 | 11 | 4 | 5 | 4 |  | 4 | 4 | 6 | 8 | 38 | 25 | 26 | 60 | 45 | 17 | 18 | 19.7 | 23 | 60 | 20 | 6[illegible] |
| 22 | 26 | 15 | 13 | 9 | 10 | 16 | 29 | 30 | 44 | 20 | 9 | 7 |  | 6 | 9 | 13 | 17 | 55 | 45 |  |  |  |  |  | 21.8 | 18 | 55 | 17 | 7 |
| 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 24 |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 | 1 | 1 | 6 | 16 | 27 | 18 | 20 | 21 | 31 | 35 | 16.1 | 11 | 35 | 0 | *[illegible] |
| 25* | 31 | 29 | 20 | 17 | 15 | 18 | 19 | 28 | 13 | 9 | 3 | 3 |  | 3 | 3 | 3 | 10 | 23 | 14 | 28 | 25 | 22 | 16 | 17 | 16.0 | 23 | 31 | 0 | 35 |
| 26* | 19 | 15 | 13 | 15 | 12 | 8 | 9 | 15 | 14 | 7 | 3 | 3 |  | 2 | 2 | 2 | 3 | 13 | 18 | 24 | 27 | 31 | 30 | 22 | 13.4 | 23 | 31 | 21 | 3[illegible] |
| 27 | 17 | 12 | 10 | 11 | 13 | 13 | 13 | 17 | 37 | 17 | 9 | 5 |  | 1 | 2 | 2 | 12 | 20 | 27 | 26 | 31 | 19 | 23 | 21 | 15.6 | 23 | 37 | 8 | 4[illegible] |
| 28 | 15 | 9 | 5 | 4 | 5 | 6 | 13 | 27 | 35 | 16 | 5 | 4 |  | 2 | 3 | 5 | 11 | 23 | 24 | 21 | 24 | 28 | 27 | 17 | 14.1 | 23 | 35 | 8 | 4[illegible] |
| 29 | 22 | 10 | 8 | 7 | 6 | 8 | 13 | 37 | 37 | 13 | 7 | 4 |  | 1 | 4 | 4 | 12 | 25 | 15 | 11 | 25 | 36 | 38 | 27 | 16.0 | 23 | 38 | 8 | 4[illegible] |
| 30* | 15 | 17 | 11 | 8 | 8 | 15 | 25 | 39 | 29 | 4 | 5 | 5 |  | 5 | 7 | 9 | 23 | 45 | 57 | 52 | 36 | 38 | 36 | 32 | 22.7 | 23 | 57 | 18 | 6[illegible] |
| AVE | 22 | 15 | 13 | 11 | 11 | 11 | 14 | 21 | 18 | 9 | 5 | 4 |  | 3 | 4 | 5 | 9 | 19 | 20 | 22 | 26 | 26 | 25 | 23 | 14.6 |  | 38 |  | 4[illegible] |
| N | 26 | 25 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 23 | 25 | 26 |  | 27 | 27 | 27 | 26 | 27 | 27 | 26 | 26 | 26 | 26 | 26 |  | 595 | 28 |  | 2[illegible] |
| MAX | 32 | 39 | 29 | 27 | 26 | 22 | 29 | 52 | 58 | 35 | *16 | 9 |  | 6 | 9 | 13 | 23 | 55 | 57 | 52 | 60 | 56 | 60 | 55 | 24.4 |  | 60 |  | 7[illegible] |

*WEEKEND OR HOLIDAY. ***INSUFFICIENT DATA FOR DAY TO DETERMINE A MAXIMUM.

JB NUMBER =SAMU4A
OGRAM =SAMUPA01
TE 12/26/72

AIR POLLUTION CONTROL DISTRICT - COUNTY OF LOS ANGELES

NITROGEN DIOXIDE / HOURLY AVERAGE / IN PPHM

VA. 21

STATION 75

11 / 1972

| AY | HOUR PST | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | AVE. | N | 1HR MAX | INSTANT. HR | INSTANT. MAX |
| 1 | 10 | 8 | 7 | 7 | 7 | 6 | 6 | 6 | 9 | 8 | 6 | 6 | | 7 | 9 | 12 | 11 | 11 | 11 | 12 | 11 | 11 | 12 | 10 | 8.8 | 23 | 12 | 15 | 13 |
| 2 | 13 | 9 | 9 | 9 | 8 | 8 | 8 | 10 | 14 | 16 | 10 | 10 | | 11 | 10 | 13 | 19 | 26 | 25 | 24 | 23 | 21 | 17 | 17 | 14.2 | 23 | 26 | 17 | 27 |
| 3 | 16 | 12 | 10 | 13 | 10 | 8 | 8 | 13 | 17 | | 10 | 10 | | 10 | 11 | 14 | 22 | 30 | 30 | 28 | 26 | 22 | 21 | 15 | 16.4 | 22 | 30 | 17 | 34 |
| 4* | 19 | 17 | 10 | 5 | 11 | 8 | 10 | 10 | 8 | 9 | 8 | 5 | | 7 | 8 | 8 | 11 | 12 | 9 | 8 | 9 | 8 | 8 | 9 | 9.4 | 23 | 19 | 0 | 20 |
| 5* | 8 | 9 | 7 | 6 | 7 | 6 | 6 | 4 | 5 | 5 | 3 | 4 | | 3 | 4 | 5 | 7 | 12 | 15 | 14 | 14 | 12 | 10 | 8 | 7.5 | 23 | 15 | 18 | 16 |
| 6 | 10 | 10 | 10 | 8 | 7 | 7 | 8 | 9 | 11 | 14 | 10 | 6 | | | | | | | | | | | | | 9.2 | 12 | 14 | 9 | 16 |
| 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | 3 | 3 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4.5 | 11 | 5 | 0 | ** |
| 9 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 5 | 7 | 7 | 5 | 5 | | 3 | 7 | 10 | | 15 | 15 | 13 | 12 | 12 | 12 | 13 | 7.6 | 22 | 15 | 17 | 17 |
| 0 | 12 | 12 | 11 | 11 | 11 | 11 | 11 | 10 | 12 | 14 | 10 | 7 | | 7 | 7 | 6 | 6 | 6 | 7 | 8 | 6 | 6 | 6 | 5 | 8.8 | 23 | 14 | 9 | 16 |
| 1* | 6 | 5 | 5 | 5 | 4 | 4 | 2 | 2 | 4 | 4 | 3 | 3 | | 2 | 2 | 4 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 3.9 | 23 | 6 | 0 | 6 |
| 2* | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 2 | | 3 | 3 | 4 | 5 | 6 | 6 | 6 | 6 | 5 | 4 | 4 | 3.9 | 23 | 6 | 20 | 6 |
| 3 | 6 | 5 | 5 | 5 | 4 | 4 | 4 | 6 | 7 | 5 | 4 | 3 | | 5 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 6 | 6 | 5.6 | 23 | 7 | 8 | [illegible] |
| 4 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 5 | 5 | | 4 | 3 | | 3 | 4 | 4 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4.6 | 22 | 6 | 15 | 6 |
| 5 | 4 | 3 | 4 | 3 | 3 | 3 | 2 | 3 | 4 | 5 | 3 | 3 | | 4 | 4 | 5 | 6 | 6 | 6 | 6 | 5 | 5 | 6 | 5 | 4.3 | 23 | 6 | 17 | 6 |
| 6 | 4 | 4 | 4 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | | 3 | 4 | 4 | 6 | 6 | 4 | 4 | 5 | 4 | 4 | 4 | 3.7 | 23 | 6 | 17 | 6 |
| 7 | 3 | 2 | 2 | 2 | 1 | 1 | 3 | 3 | 3 | | | 1 | | 3 | 3 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 4 | 4 | 3.1 | 21 | 5 | 19 | 6 |
| 8* | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 5 | 6 | 5 | 4 | | 5 | 6 | 8 | 10 | 10 | 10 | 10 | 10 | 10 | 9 | 8 | 6.2 | 23 | 10 | 16 | 11 |
| 9* | 7 | 5 | 6 | 6 | 4 | 5 | 6 | 6 | 5 | 5 | 7 | 8 | | 5 | 7 | 9 | 11 | 10 | 11 | 10 | 10 | 9 | 7 | 6 | 7.2 | 23 | 11 | 16 | 12 |
| 0 | 5 | 5 | 4 | 4 | 4 | 5 | 5 | 6 | 7 | 7 | 6 | 7 | | 7 | 8 | 9 | 11 | 13 | 11 | 11 | 10 | 8 | 7 | 7 | 7.4 | 23 | 13 | 17 | 13 |
| 1 | 6 | 5 | 5 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | 6 | 9 | 10 | 8 | 8 | 9 | 9 | 6 | 5 | 6.0 | 23 | 10 | 17 | 11 |
| 2 | 5 | 4 | 4 | 3 | 4 | 4 | 4 | 6 | 6 | 6 | 5 | 5 | | 5 | 7 | 8 | 10 | 11 | 8 | | | | | | 5.8 | 18 | 11 | 17 | 12 |
| 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | 2 | 3 | 1 | 6 | 11 | 12 | 10 | 10 | 8 | 8 | 8 | 7.2 | 11 | 12 | 0 | ** |
| 5* | 9 | 7 | 7 | 6 | 6 | 7 | 5 | 5 | 7 | 9 | 7 | 7 | | 7 | 7 | 10 | 14 | 16 | 14 | 12 | 9 | 7 | 5 | 5 | 8.2 | 23 | 16 | 17 | 16 |
| 6* | 5 | 5 | 5 | 5 | 5 | 4 | 3 | 3 | 4 | 7 | 7 | 5 | | 3 | 5 | 6 | 9 | 13 | 16 | 16 | 11 | 9 | 7 | 5 | 6.9 | 23 | 16 | 18 | 17 |
| 7 | 4 | 5 | 6 | 7 | 7 | 6 | 7 | 7 | 11 | 8 | 7 | 10 | | 10 | 12 | 15 | 19 | 19 | 18 | 13 | 11 | 8 | 8 | 7 | 9.8 | 23 | 19 | 16 | 19 |
| 8 | 6 | 6 | 4 | 4 | 4 | 4 | 4 | 5 | 8 | 8 | 6 | 5 | | 6 | 9 | 11 | 12 | 13 | 11 | 11 | 11 | 10 | 9 | 9 | 7.7 | 23 | 13 | [illegible] | 13 |
| 9 | 8 | 7 | 5 | 7 | 7 | 7 | 5 | 7 | 9 | 7 | 6 | 4 | | 3 | 4 | 4 | 7 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5.5 | 23 | 9 | 8 | 10 |
| 0* | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 5 | 6 | 5 | 6 | 7 | | 6 | 8 | 9 | 12 | 12 | 9 | 8 | 7 | 7 | 6 | 5 | 6.1 | 23 | 12 | 17 | 13 |
| VE | 7 | 6 | 6 | 5 | 5 | 5 | 5 | 6 | 7 | 7 | 6 | 5 | | 5 | 6 | 7 | 10 | 11 | 11 | 10 | 9 | 9 | 8 | 7 | 7.1 | | 12 | | 14 |
| N | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 23 | 25 | 26 | | 27 | 27 | 27 | 26 | 27 | 27 | 26 | 26 | 26 | 26 | 26 | | 599 | 28 | | 26 |
| AX | 19 | 17 | 11 | 13 | 11 | 11 | 11 | 13 | 17 | 16 | 10 | 10 | | 11 | 12 | 15 | 22 | 30 | 30 | 28 | 26 | 22 | 21 | 19 | 16.4 | | 30 | | 34 |

*WEEKEND OR HOLIDAY. **INSUFFICIENT DATA FOR DAY TO DETERMINE A MAXIMUM.

JOB NUMBER =
P4J0R64 =SUAMAU3
DATE: 01/05/73

AIR POLLUTION CONTROL DISTRICT - COUNTY OF LOS ANGELES

NO. 29

NO + NO2 - SUM OF NO AND NO2 / HOURLY AVERAGE / PPHM

STATION 75

11 / 1972

| DAY | <-- HOUR PST 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 --> | AVE. | N | 1HR MAX | INSTANT. HR | INSTANT. MAX |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 47 | 29 | 19 | 16 | 20 | 20 | 27 | 46 | 33 | 20 | 12 | 11 |  | 11 | 14 | 20 | 18 | 22 | 28 | 33 | 32 | 46 | 59 | 54 | 27.7 | 23 | 059 | 22 | 70 |
| 02 | 42 | 32 | 33 | 36 | 33 | 30 | 30 | 34 | 41 | 25 | 14 | 14 |  | 14 | 13 | 17 | 24 | 40 | 57 | 72 | 54 | 77 | 77 | 72 | 36.6 | 23 | 077 | 21 | 98 |
| 03 | 68 | 51 | 39 | 36 | 36 | 28 | 26 | 35 | 44 |  | 16 | 14 |  | 13 | 13 | 16 | 26 | 38 | 40 | 39 | 42 | 45 | 57 | 44 | 34.0 | 22 | 068 | 00 | 74 |
| 04* | 55 | 47 | 18 | 6 | 13 | 9 | 14 | 16 | 10 | 12 | 10 | 8 |  | 11 | 13 | 12 | 25 | 34 | 19 | 22 | 25 | 22 | 17 | 24 | 19.2 | 23 | 055 | 00 | 64 |
| 05* | 17 | 14 | 18 | 15 | 15 | 13 | 11 | 10 | 8 | 7 | 4 | 6 |  | 5 | 6 | 7 | 9 | 15 | 24 | 33 | 47 | 40 | 46 | 42 | 17.9 | 23 | 047 | 20 | 53 |
| 06 | 28 | 19 | 21 | 20 | 23 | 21 | 34 | 32 | 27 | 27 | 17 | 10 |  |  |  |  |  |  |  |  |  |  |  |  | 23.2 | 12 | 034 | 06 | 44 |
| 07 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 08 |  |  |  |  |  |  |  |  |  |  |  |  |  | 7 | 7 | 9 | 10 | 18 | 19 | 26 | 34 | 33 | 24 | 22 | 19.0 | 11 | 034 | 00 | ** |
| 09 | 22 | 16 | 15 | 15 | 18 | 25 | 30 | 25 | 24 | 14 | 7 | 8 |  | 4 | 10 | 14 |  | 30 | 31 | 32 | 36 | 40 | 33 | 31 | 21.0 | 22 | 040 | 20 | 46 |
| 10 | 30 | 35 | 34 | 33 | 30 | 32 | 38 | 49 | 70 | 49 | 26 | 16 |  | 12 | 12 | 12 | 17 | 16 | 17 | 21 | 15 | 12 | 13 | 10 | 26.1 | 23 | 070 | 08 | 76 |
| 11* | 13 | 9 | 11 | 10 | 5 | 6 | 3 | 3 | 7 | 7 | 7 | 6 |  | 4 | 4 | 10 | 11 | 20 | 23 | 17 | 26 | 16 | 12 | 16 | 10.7 | 23 | 026 | 20 | 39 |
| 12* | 21 | 27 | 22 | 16 | 17 | 15 | 17 | 15 | 12 | 12 | 7 | 4 |  | 5 | 5 | 7 | 9 | 11 | 16 | 22 | 27 | 28 | 22 | 21 | 15.6 | 23 | 028 | 01 | 33 |
| 13 | 25 | 17 | 10 | 11 | 12 | 16 | 20 | 26 | 20 | 9 | 8 | 5 |  | 9 | 11 | 11 | 15 | 22 | 27 | 27 | 42 | 40 | 34 | 39 | 20.0 | 23 | 042 | 20 | 53 |
| 14 | 31 | 23 | 25 | 17 | 18 | 14 | 15 | 19 | 12 |  | 5 | 5 |  | 4 | 7 | 8 | 12 | 16 | 26 | 36 | 39 | 21 | 17 | 21 | 17.8 | 22 | 039 | 19 | 58 |
| 15 | 16 | 15 | 13 | 8 | 7 | 7 | 5 | 13 | 13 | 14 | 6 | 4 |  | 9 | 9 | 12 | 21 | 19 | 15 | 23 | 20 | 24 | 31 | 27 | 14.4 | 23 | 031 | 22 | 40 |
| 16 | 10 | 11 | 3 | 3 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 |  | 4 | 9 | 9 | 21 | 23 | 14 | 11 | 17 | 8 | 6 | 7 | 8.3 | 23 | 023 | 16 | 27 |
| 17 | 6 | 3 | 3 | 3 | 2 | 2 | 4 | 4 | 5 |  |  | 2 |  | 6 | 6 | 9 | 14 | 18 | 26 | 29 | 28 | 35 | 34 | 31 | 12.9 | 21 | 035 | 22 | 46 |
| 18* | 34 | 21 | 23 | 19 | 19 | 21 | 25 | 25 | 16 | 13 | 11 | 7 |  | 7 | 9 | 10 | 16 | 19 | 25 | 33 | 29 | 38 | 26 | 30 | 20.7 | 23 | 038 | 00 | 46 |
| 19* | 34 | 27 | 25 | 24 | 15 | 14 | 11 | 12 | 10 | 8 | 11 | 13 |  | 6 | 9 | 13 | 18 | 16 | 22 | 26 | 45 | 45 | 34 | 16 | 19.7 | 23 | 045 | 20 | 53 |
| 20 | 15 | 19 | 10 | 12 | 13 | 10 | 11 | 12 | 21 | 17 | 14 | 12 |  | 11 | 13 | 14 | 24 | 58 | 39 | 47 | 48 | 32 | 30 | 39 | 22.7 | 23 | 058 | 17 | 65 |
| 21 | 33 | 28 | 22 | 17 | 15 | 17 | 27 | 57 | 16 | 9 | 10 | 9 |  | 9 | 9 | 12 | 17 | 48 | 33 | 34 | 69 | 54 | 23 | 23 | 25.7 | 23 | 069 | 20 | 74 |
| 22 | 33 | 20 | 14 | 12 | 14 | 20 | 33 | 56 | 50 | 26 | 14 | 12 |  | 11 | 16 | 21 | 27 | 66 | 53 |  |  |  |  |  | 27.7 | 18 | 066 | 17 | 84 |
| 23* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 24 |  |  |  |  |  |  |  |  |  |  |  |  |  | 3 | 4 | 2 | 12 | 27 | 39 | 28 | 30 | 29 | 39 | 43 | 23.3 | 11 | 043 | 00 | ** |
| 25* | 40 | 35 | 27 | 23 | 21 | 25 | 24 | 33 | 20 | 18 | 10 | 10 |  | 10 | 10 | 13 | 24 | 39 | 28 | 40 | 34 | 29 | 21 | 22 | 24.2 | 23 | 040 | 17 | 46 |
| 26* | 24 | 20 | 18 | 20 | 17 | 12 | 12 | 18 | 18 | 14 | 10 | 8 |  | 5 | 7 | 8 | 12 | 26 | 34 | 40 | 38 | 40 | 37 | 27 | 20.2 | 23 | 040 | 21 | 43 |
| 27 | 21 | 17 | 15 | 18 | 20 | 19 | 20 | 24 | 48 | 25 | 16 | 15 |  | 11 | 14 | 17 | 31 | 39 | 45 | 39 | 42 | 27 | 31 | 28 | 25.3 | 23 | 048 | 08 | 56 |
| 28 | 16 | 15 | 5 | 8 | 9 | 10 | 17 | 32 | 43 | 24 | 11 | 9 |  | 8 | 12 | 16 | 23 | 36 | 35 | 32 | 35 | 38 | 36 | 26 | 21.[illegible] | 23 | 043 | 06 | 57 |
| 29 | 30 | 17 | 11 | 14 | 13 | 15 | 19 | 44 | 46 | 20 | 13 | 8 |  | 4 | 8 | 8 | 19 | 29 | 19 | 15 | 29 | 40 | 42 | 31 | 21.5 | 23 | 046 | 06 | 57 |
| 30 | 20 | 20 | 14 | 11 | 11 | 18 | 30 | 44 | 35 | 9 | 11 | 12 |  | 11 | 15 | 18 | 35 | 57 | 66 | 60 | 43 | 45 | 42 | 37 | 26.9 | 23 | 066 | 16 | 71 |
| AVE | 29 | 23 | 18 | 16 | 16 | 16 | 20 | 26 | 25 | 17 | 11 | 9 |  | 8 | 10 | 12 | 19 | 30 | 30 | 32 | 36 | 35 | 32 | 30 | 21.7 |  | 47 |  | 57 |
| N | 26 | 28 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 23 | 25 | 26 |  | 27 | 27 | 27 | 26 | 27 | 27 | 26 | 26 | 26 | 26 | 26 |  | 595 | 28 |  | 26 |
| MAX | 68 | 51 | 39 | 36 | 36 | 32 | 38 | 57 | 70 | 49 | 26 | 16 |  | 14 | 16 | 21 | 35 | 66 | 66 | 72 | 69 | 77 | 77 | 72 | 38.6 |  | 77 |  | 90 |

*WEEKEND OR HOLIDAY. **INSUFFICIENT DATA FOR DAY TO DETERMINE A MAXIMUM

```
JOB NUMBER [illegible]                AIR POLLUTION CONTROL DISTRICT - COUNTY OF LOS ANGELES                           VA.  12
PROGRAM    [illegible]
DATE: 12/25/72                               OZONE BY KI / HOURLY AVERAGE / IN PPHM                  STATION  75       11 / 1972

DAY   <-----------------------------------------------------HOUR PST--------------------------------->          1HR  INSTANT.
       0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23   AVE.   N  MAX   HR  MAX

 1     1   1   1   1       1   1   1   1   1   2   3   4   5   4   2   2   1   1   1   1   1   1   1   1.7  23    5   14    6
 2     1   1   1   1       1   1   1   1   2   4   5   6   7   7   7   6   2   3   3   3   3   2   2   3.0  23    7   13    6
 3     1   1   1   1       1   1   2   2   2   4   5   6   7  10  12   8   4   2   2   2   2   2   2   3.5  23   12   14   13
 4*    2   2   4   6       1   1   1   3   3   4   4   3   3   3   4   2   2   1   1   1   1   1   1   2.4  23    6    3    8
 5*    1   1   1   1       1   1   1   2   3   3   4   4   4   5   5   4   2   1   1   1   1   1   1   2.1  23    5   15    6

 6     1   1   1   1       1   1   1   1   2   2   2   4   4   4   3   3   2   2   3   2   2   1   1   2.0  23    4   14    5
 7     1   1   1   1       1   1   1   1   1   1   2   2   4   3   2   1   1   1   1   1   1   1   1   1.4  23    4   13    4
 8     1   1   1   1       1   1   1   1   2   3   4   3   3   4   3   2   1   1   1   1   1   1   1   1.7  23    4   11    4
 9     1   1   1   1       1   1   1   1   1   3   3   4   5   5   6   4   2   2   2   2   2   2   2   2.3  23    6   15    7
10     2   2   1   1       1   1   1   1   1   2   1   1   3   3   2   1   1   1   1   1   1   1   1   1.4  23    3   15    3

11*    1   1   1   1       1   2   2   1   2   3   3   3   3   2   1   1   1   1   1   1   1   1   1   1.5  23    3   12    4
12*    1   1   1   1       1   1   1   1   1   1   2   2   2   2   2   1   1   1   1   1   1   1   1   1.2  23    2   14    3
13     1   1   1   1       1   1   1   1   2   2   3   3   3   2   2   1   1   1   1   1   1   1   1   1.4  23    3   12    4
14     1   1   1   1       1   1   1   1   1   1   1   2   1   1   1   1   1   1   1   1   1   1   1   1.0  23    2   12    3
15     1   1   1   1       1   1   1   1   1   1   2   1   1   2   1   1   1   1   1   1   1   1   1   1.1  23    2   11    2

16     1   1   1   1       1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1.0  23    1   14    2
17     1   1   1   1       1   1   1   1   2   3   2   2   2   2   1   1   1   1   1   1   1   1   1   1.3  23    3   10    4
18     1   1   1   1       1   1   1   1   1   1   2   3   3   4   4   2   1   1   1   1   1   1   1   1.5  23    4   15    5
19     1   1   1   1       1   1   1   1   1   2   3   4   5   4   3   1   1   1   1   1   1   1   1   1.7  23    5   13    6
20     1   1   1   1       1   1   1   2   2   2   3   3   4   4   3   2   1   1   1   1   1   1   1   1.7  23    4   13    6

21     1   1   1   1       1   1   1   1   1   2   2   3   3   3   3   2   1   1   1   1   1   1   1   1.5  23    3   14    4
22     1   1   1   1       1   1   1   1       1   1   1   2   1   1   1   1   1   1   1   1   1   1   1.1  22    2   13    2
23     1   1   1   1       1   1   1   1   1   2   2   3   3   4   3   1   1   1   1   1   1   1   1   1.5  23    4   14    5
24     1   1   1   1       1   1   1   1   1   1       3   3   3   2   1   1   1   1   1   1   1   1   1.3  22    3   12    5
25*    1   1   1   1       1   1   1   1   2   3   3   4   5   5   5   3   3   3   2   2   1   1   1   2.2  23    5   14    6

26*    1   1   1   1       1   1   1   1   2   3   3   2   3   4   5   4   3   4   3   2   1   1   1   2.1  23    5   15    6
27     1   1   1   1       1   1   1   1   1   1   4   6   7   7   6   4   4   3   3   2   1   1   1   2.6  23    7   14    6
28     1   1   1   1       1   1   1   1   1   2   2   3   4   4   4   2   2   2   2   2   1   1   1   1.8  23    4   13    5
29     1   1   1   1       1   1   1   1   2   2   3   4   4   3   3   1   1   1   1   1   1   1   1   1.6  23    4   13    5
30*    1   1   1   1       1   1   1   1   2   2   2   3   3   3   3   2   2   1   1   1   1   1   1   1.6  23    3   12    4
-------------------------------------------------------------------------------------------------------------------------------
AVE    1   1   1   1       1   1   1   1   2   2   3   3   4   4   3   2   2   1   1   1   1   1   1   1.7         4         5
N     30  30  30  30      30  30  30  30  29  30  29  30  30  30  30  30  30  30  30  30  30  30  30       688   30        30
MAX    2   2   4   6       1   2   2   3   3   4   5   6   7  10  12   8   4   4   3   3   3   2   2   3.5        12        13
*=WEEKEND OR HOLIDAY. **=INSUFFICIENT DATA FOR DAY TO DETERMINE A MAXIMUM.
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JOB NUMBER =SAMU4A                        AIR POLLUTION CONTROL DISTRICT - COUNTY OF LOS ANGELES                           VA.  15
PROGRAM    =GAPUPAO1
DATE: 12/26/72                                  CARBON MONOXIDE / HOURLY AVERAGE / IN PPM                   STATION  75       11 / 1972

DAY   <-----------------------------------------------------HOUR PST------------------------------------>.              1HR   INSTANT.
       0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23    AVE.   N   MAX   HR   MAX

01     9   7   5   5   5   5   6   9   9   6   5   5   5   5   5   5   6   7   7   7   8  10  11  10     6.8  24    11   22    13
02     9   8   7   7   6   6   8   9  10   6   5   5   5   4   5   6   7   8  10  12  11  15  13  13     8.1  24    15   21    17
03    11   9   9   7   6   6   7   9  11       6   5   4   5   6   7   9  11   9   9  12  12  13  12     8.4  23    13   22    14
04*   13  11   5   5   7   6   7   7   6   6   6   5   5   5   5   5   8   8   5   6   6   6   5   6     6.5  24    13    0    15
05*    5   6   5   5   5   5   4   5   4   4   3   4   3   4   4   4   5   5   7   8   8   8   9   8     5.3  24     9   22    11

06     6   5   6   5   5   5   7   8   7   7   5   4   3   3   4   6   7   9  10  12  11  10   8  10     6.8  24    12   21    15
07    10   8   6   6   5   5   7   9   9   8   6   6   5   6   6   6   6   6   6   5   6   5   5   5     6.3  24    10    0    11
08     5   5   4   4   4   4   5   6   6   4   4   4   4       5   5   5   7   6   8   8   8   7   6     5.4  23     8   21    10
09     6   5   5   4   5   5   6   6   6   5   4   4   4   4   5   6   7   9   8   8   9   9   8   8     6.1  24     9   20    11
10     8   8   8   8   7   7   8  12  16       6   5   4   5   5   6   7   6   6   6   5   5   4   5     6.8  23    16    8    17

11*    4   4   4   4   3   3   3   3   4   4   4   4   3   3   3   4   5   6   7   6   7   4   5   5     4.3  24     7   20     9
12*    7   7   6   6   5   5   5   5   5   5   4   4   4   4   4   4   4   5   6   6   7   6   6   6     5.3  24     7    3    10
13     5   4   4   4   4   5   5   7   7   5   4   4   5   5   5   5   6   7   8   7   8   8   8   9     5.9  24     9   23    11
14     7   6   6   5   5   4   5   5   5   4   4   4   4   4   4   5   8   9  12  16  12   7   7   7     6.5  24    16   19    20
15     6   6   5   5   4   4   4   7   7   5   4   4   5   5   5   6   8   7   6   7   6   8   9   7     5.8  24     9   21    11

16     4   4   4   3   3   3   3   3   3   4   3   3   4   4   5   6   8   8   5   6   5   4   4   4     4.3  24     8   17    10
17     3   3   3   3   3   3   3   4   3   3   3   3   3   4   4   5   7   7   9   8   9  11  10   9     5.1  24    11   20    12
18*   11   7   7   5   6   6   7   6   6   4   4   3   4   4   4   5   6   6   7   7   8   9   8   8     6.2  24    11    0    14
19*    9   8   8   6   5   5   4   5   4   4   5   5   4   4   4   5   5   5   7   8  12  10   8   6     6.1  24    12    0    15
20     6   6   4   4   4   4   4   5   8   6   6   5   5   5   6   6   9  15  10  12  11   8   8   8     6.9  24    15   17    21

21     6   5   5   4   3   4   6  12   5       4   4   4   4   4   5   6  12   9  10  14  11   6   8     6.7  23    14   20    15
22     5   5   3   3   3   4   7  13  13   6   5   5   5   5   6   7  10  17  14  15  15  14  11  12     8.6  24    17   17    23
23    13   7   7   6   4   4   4   4   4   4   4   4   4   4   4   4   5   7  10   9   8   7   6   7     5.8  24    13    0    15
24     6   5   4   4   5   5   6   8   6   6   5   5   5   5   5   5   7   9  10   8   8   8  10  11     6.5  24    11   16    14
25*   11  12   9   9   6   6   7   8   7   8   6   5   5   5   5   5   8  11   9  11  10  10   7   8     7.8  24    12    1    15

26*    7   6   5   5   5   4   4   6   6   6   5   4   4   4   4   5   7   9  10  12  12  12  11   8     6.7  24    12   20    14
27     7   6   6   6   6   6   7  11  15   7   7   7   7   7   7   8  13  19  17  16  13  10  10  10     9.5  24    19   17    29
28     7   5   4   4   4   4   7  13  18   8   5   5   5   5   6   7  10  13  12  11  10  11  10   8     8.0  24    18    8    26
29     8   5   5   5   5   5   7  12  14   7   6   5   4   5   5   6   6  13   8   7   9  10  10   7     7.3  24    14    8    19
30*    6   6   5   4   4   4   7  11   8   5   6   6   6   6   6   8  13  18  17  14  11  11  10   9     8.4  24    18   17    22
-------------------------------------------------------------------------------------------------------------------------------------
AVE    8   6   5   5   5   5   5   8   8   5   5   5   4   5   5   6   7   9   9   9   9   9   8   8     6.6          12          15
N     30  30  30  30  30  30  30  30  30  27  30  30  30  29  30  30  30  30  30  30  30  30  30  30          716   30          30
MAX   13  12   9   9   7   7   8  13  18   8*  7   7   7   7   7   8  13  19  17  16  15  15  13  13     9.5          19          29
**WEEKEND OR HOLIDAY. ***INSUFFICIENT DATA FOR DAY TO DETERMINE A MAXIMUM.
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Reproduced from best available copy.

JOB NUMBER #SAMU9A
PROGRAM #SAMUPAO.
DATE: 12/27/72

AIR POLLUTION CONTROL DISTRICT - COUNTY OF LOS ANGELES

HYDROCARBONS, AS METHANE / HOURLY AVERAGE / IN PPM

NO. 31
STATION 75
11 / 1972

| DAY | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | AVE. | N | 1HR MAX | INSTANT. HR | INSTANT. MAX |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | <----- | | | | | | | | | | | | | | HOUR PST | | | | | | | | | -----> | | | | | |
| 01 | 4 | 3 | 3 | 3 | 4 | 4 | 4 | 3 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 5 | 4 | 3.1 | 24 | 5 | 22 | 5 |
| 02 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 5 | 6 | 5 | 6 | 3.8 | 24 | 6 | 23 | 7 |
| 03 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | | 3 | 2 | 2 | 2 | 3 | 3 | 4 | 5 | 5 | 5 | 5 | 5 | 6 | 5 | 4.0 | 23 | 6 | 22 | 6 |
| 04* | 6 | 5 | 4 | 3 | 4 | 4 | 5 | 4 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3.3 | 24 | 6 | 0 | 6 |
| 05* | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 2.9 | 24 | 4 | 22 | 4 |
| 06 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | | 2 | 2 | 2 | 2 | 2 | 3 | 4 | 4 | 5 | 5 | 4 | 4 | 5 | 3.5 | 23 | 5 | 19 | 5 |
| 07 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3.3 | 24 | 5 | 1 | 5 |
| 08 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 3 | 4 | 4 | 3 | 2.8 | 24 | 4 | 22 | 4 |
| 09 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 3.0 | 24 | 4 | 22 | 4 |
| 10 | 4 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 5 | | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3.0 | 23 | 5 | 3 | 5 |
| 11* | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 4 | 3 | 3 | 3 | 2 | 3 | 3 | 2.3 | 24 | 4 | 17 | 4 |
| 12* | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2.6 | 24 | 4 | 3 | 4 |
| 13 | 3 | 3 | 2 | 3 | 3 | 4 | 5 | 4 | | | | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3.0 | 21 | 5 | 6 | 5 |
| 14 | 3 | 3 | 3 | 4 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 5 | 5 | 3 | 3 | 3 | 2.9 | 24 | 5 | 19 | 6 |
| 15 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 2.9 | 24 | 4 | 7 | 4 |
| 16 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2.3 | 24 | 3 | 1 | 3 |
| 17 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 2.5 | 24 | 4 | 21 | 4 |
| 18* | 4 | 3 | 3 | 3 | 4 | 5 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 3.2 | 24 | 5 | 5 | 5 |
| 19* | 5 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 5 | 4 | 4 | 3 | 3.3 | 24 | 5 | 20 | 5 |
| 20 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 5 | 4 | 5 | 4 | 3 | 4 | 4 | 3.1 | 24 | 5 | 17 | 5 |
| 21 | 4 | 4 | 3 | 3 | 3 | 2 | 3 | 4 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 4 | 3 | 4 | 5 | 4 | 3 | 4 | 3.0 | 24 | 5 | 20 | 5 |
| 22 | 4 | 3 | 3 | 2 | 3 | 3 | 4 | 5 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 4 | 5 | 5 | 6 | 5 | 5 | 5 | 5 | 3.6 | 24 | 6 | 7 | 6 |
| 23 | 5 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 2.9 | 24 | 5 | 0 | 6 |
| 24 | 3 | 3 | 2 | 3 | 5 | 4 | 4 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 5 | 3 | 3 | 3 | 3 | 4 | 4 | 3.1 | 24 | 5 | 17 | 5 |
| 25* | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 4 | 3 | 4 | 3 | 5 | 3 | 3 | 3.0 | 24 | 5 | 21 | 6 |
| 26* | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 3 | 2.6 | 24 | 4 | 15 | 4 |
| 27 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 5 | 5 | | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 6 | 6 | 6 | 4 | 4 | 4 | 4 | 3.5 | 23 | 6 | 17 | 7 |
| 28 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 4 | 5 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3.1 | 24 | 5 | 6 | 7 |
| 29 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 4 | 3 | 3 | 3 | 4 | 4 | 3 | 3.0 | 24 | 4 | 6 | 5 |
| 30* | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 4 | 5 | 7 | 5 | 4 | 4 | 4 | 4 | 3.3 | 24 | 7 | 16 | 7 |
| AVE | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3.1 | | 5 | | 5 |
| N | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 29 | 26 | 28 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | | 715 | 30 | | 30 |
| MAX | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 6 | 7 | 6 | 5 | 6 | 6 | 6 | 4.0 | | 7 | | 7 |

*=WEEKEND OR HOLIDAY. **=INSUFFICIENT DATA FOR DAY TO DETERMINE A MAXIMUM.

JOB NUMBER =SAM04A
PROGRAM =SAMOPAD1
DATES 12/26/72

AIR POLLUTION CONTROL DISTRICT - COUNTY OF LOS ANGELES

VA. 32

METHANE / HOURLY AVERAGE / IN PPM

STATION 75

11 / 1972

| DAY | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | AVE. | N | 1HR MAX | INSTANT. HR | INSTANT. MAX |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 2.3 | 24 | 3 | 22 | 3 |
| 02 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2.7 | 24 | 3 | 23 | 4 |
| 03 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |  | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 2.8 | 23 | 4 | 22 | 4 |
| 04* | 4 | 4 | 3 | 2 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2.5 | 24 | 4 | 6 | 4 |
| 05* | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2.4 | 24 | 3 | 7 | 3 |
| 06 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |  | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2.7 | 23 | 3 | 20 | 3 |
| 07 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2.4 | 24 | 3 | 1 | 3 |
| 08 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2.1 | 24 | 3 | 22 | 3 |
| 09 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 2.5 | 24 | 3 | 4 | 3 |
| 10 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |  | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2.4 | 23 | 3 | 5 | 4 |
| 11* | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2.0 | 24 | 2 | 16 | 2 |
| 12* | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2.1 | 24 | 3 | 23 | 3 |
| 13 | 3 | 2 | 2 | 2 | 3 | 3 | 4 | 4 |  |  |  | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2.4 | 21 | 4 | 7 | 4 |
| 14 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 2.1 | 24 | 3 | 5 | 3 |
| 15 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2.2 | 24 | 3 | 4 | 3 |
| 16 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2.0 | 24 | 2 | 6 | 3 |
| 17 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 2.1 | 24 | 3 | 23 | 3 |
| 18* | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 2.6 | 24 | 4 | 5 | 4 |
| 19* | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2.6 | 24 | 3 | 0 | 3 |
| 20 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2.7 | 24 | 3 | 20 | 3 |
| 21 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2.4 | 24 | 3 | 21 | 3 |
| 22 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2.5 | 24 | 3 | 23 | 3 |
| 23 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 2.4 | 24 | 3 | 0 | 3 |
| 24 | 3 | 2 | 2 | 3 | 4 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2.2 | 24 | 4 | 4 | 5 |
| 25* | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2.1 | 24 | 3 | 3 | 3 |
| 26* | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1.8 | 24 | 2 | 20 | 2 |
| 27 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |  | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2.7 | 23 | 3 | 16 | 3 |
| 28 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2.3 | 24 | 3 | 21 | 3 |
| 29 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2.3 | 24 | 3 | 0 | 3 |
| 30* | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2.3 | 24 | 3 | 23 | 3 |
| AVE | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 2.4 |  | 3 |  | 3 |
| N | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 29 | 26 | 28 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |  | 713 | 30 |  | 30 |
| MAX | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 2.8 |  | 4 |  | 5 |

*=WEEKEND OR HOLIDAY. **=INSUFFICIENT DATA FOR DAY TO DETERMINE A MAXIMUM.

# APPENDIX B

## INORGANIC COMPOSITION OF SELECTED AEROSOLS

## TABLE B-I. ANALYSES OF AEROSOLS ON MILLIPORE FILTERS

| Sample[b] | Elements, micrograms per filter[a] | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V | Mn | Ni | Cr | Zn | Cu | Pb | B | Ag | Sn | Fe | Sr | Na | K | Ca | Si | Mg | Ti | Al |
| Columbus | | | | | | | | | | | | | | | | | | | |
| MA-720 | <0.2 | 1.0 | 1.6 | 0.8 | 2.0 | 0.8 | 8.0 | 0.06 | <0.02 | 0.4 | 10.0 | 0.2 | 10.0 | 4.0 | 20.0 | 30.0 | 4.0 | 0.6 | 20.0 |
| MB-720 | <0.2 | 0.4 | 0.4 | 0.2 | 1.0 | 0.6 | 6.0 | <0.06 | <0.02 | 0.2 | 2.0 | 0.1 | 6.0 | 6.0 | 10.0 | 10.0 | 2.0 | 0.2 | 2.0 |
| MA-721 | <0.2 | 1.0 | 0.6 | 0.4 | 1.0 | 0.6 | 4.0 | <0.06 | <0.02 | 0.2 | 10.0 | 0.2 | 6.0 | 4.0 | 16.0 | 16.0 | 4.0 | 0.6 | 10.0 |
| MB-721 | <0.2 | 0.4 | <0.2 | 0.2 | <1.0 | 0.6 | 2.0 | <0.06 | <0.02 | 0.2 | 2.0 | 0.1 | 4.0 | 4.0 | 10.0 | 10.0 | 2.0 | 0.2 | 2.0 |
| MA-722 | <0.2 | 1.6 | <0.2 | 0.4 | 1.0 | 0.8 | 6.0 | <0.06 | <0.02 | 0.2 | 16.0 | 0.2 | 6.0 | 4.0 | 20.0 | 20.0 | 4.0 | 0.6 | 10.0 |
| MB-722 | <0.2 | 0.2 | <0.2 | 0.2 | <1.0 | 0.6 | 2.0 | <0.06 | <0.02 | 0.2 | 2.0 | 0.06 | 4.0 | 2.0 | 6.0 | 6.0 | 2.0 | 0.1 | 0.6 |
| MA-726 | <0.2 | 2.0 | 0.2 | 0.6 | 2.0 | 0.8 | 6.0 | 0.08 | 0.02 | 0.6 | 20.0 | 0.4 | 10.0 | 6.0 | 40.0 | 30.0 | 8.0 | 2.0 | 20.0 |
| MB-726 | <0.2 | 1.0 | <0.2 | 0.2 | 1.5 | 0.6 | 4.0 | <0.06 | <0.02 | 0.4 | 2.0 | 0.1 | 6.0 | 2.0 | 6.0 | 10.0 | 2.0 | 0.1 | 1.0 |
| MA-728 | <0.2 | 1.0 | 0.2 | 0.2 | 2.0 | 1.0 | 6.0 | 0.2 | <0.02 | 0.4 | 20.0 | 0.2 | 6.0 | 6.0 | 20.0 | 20.0 | 4.0 | 1.0 | 20.0 |
| MB-728 | <0.2 | 0.6 | <0.2 | 0.2 | 1.0 | 1.0 | 6.0 | 0.1 | <0.02 | 0.4 | 2.0 | 0.06 | 6.0 | 2.0 | 6.0 | 4.0 | 2.0 | 0.1 | 1.0 |
| New York | | | | | | | | | | | | | | | | | | | |
| MA-811 | 1.0 | 2.0 | 1.2 | 0.8 | 20.0 | 2.0 | 10.0 | 0.2 | 0.2 | 2.0 | 20.0 | 0.4 | 20.0 | 10.0 | 30.0 | 40.0 | 10.0 | 4.0 | 30.0 |
| MB-811 | 0.2 | 0.4 | 0.2 | 0.2 | 4.0 | 0.6 | 2.0 | 0.08 | 0.06 | 0.4 | 2.0 | 0.06 | 4.0 | 2.0 | 6.0 | 10.0 | 1.0 | 0.1 | 1.0 |
| MA-813 | 2.0 | 2.0 | 1.0 | 0.6 | 8.0 | 0.8 | 20.0 | 0.1 | 0.08 | 1.0 | 30.0 | 0.2 | 10.0 | 10.0 | 30.0 | 40.0 | 10.0 | 4.0 | 30.0 |
| MB-813 | 0.6 | 0.6 | 0.2 | 0.2 | 4.0 | 0.6 | 6.0 | 0.06 | 0.02 | 0.6 | 2.0 | 0.06 | 6.0 | 4.0 | 10.0 | 6.0 | 2.0 | 0.1 | 4.0 |
| MA-814 | 1.6 | 2.0 | 1.0 | 1.0 | 10.0 | 2.0 | 20.0 | 0.1 | 0.4 | 2.0 | 30.0 | 0.2 | 10.0 | 10.0 | 40.0 | 40.0 | 10.0 | 4.0 | 30.0 |
| MB-814 | 0.4 | 0.6 | 0.2 | 0.2 | 4.0 | 0.6 | 6.0 | 0.1 | 0.2 | 0.6 | 2.0 | 0.06 | 6.0 | 4.0 | 10.0 | 6.0 | 2.0 | 0.1 | 2.0 |
| MA-818 | 4.0 | 2.0 | 2.0 | 1.0 | 10.0 | 4.0 | 10.0 | 0.1 | 0.6 | 4.0 | 30.0 | 0.2 | 20.0 | 10.0 | 30.0 | 40.0 | 10.0 | 4.0 | 30.0 |
| MB-818 | 0.8 | 0.6 | 0.4 | 0.2 | 4.0 | 1.0 | 6.0 | 0.06 | 0.2 | 1.0 | 2.0 | 0.06 | 6.0 | 2.0 | 10.0 | 6.0 | 2.0 | 0.2 | 4.0 |
| MA-822 | 4.0 | 2.0 | 2.0 | 1.0 | 10.0 | 4.0 | 10.0 | 0.2 | 0.6 | 4.0 | 30.0 | 0.2 | 20.0 | 10.0 | 30.0 | 40.0 | 10.0 | 4.0 | 30.0 |
| MB-822 | 0.6 | 0.4 | 0.2 | 0.2 | 4.0 | 1.0 | 4.0 | 0.06 | 0.1 | 0.8 | 2.0 | 0.06 | 6.0 | 2.0 | 6.0 | 6.0 | 2.0 | 0.1 | 2.0 |

TABLE B-1. (Continued)

| Sample[b] | Elements, micrograms per filter[a] | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V | Mn | Ni | Cr | Zn | Cu | Pb | B | Ag | Sn | Fe | Sr | Na | K | Ca | Si | Mg | Ti | Al |
| New York | | | | | | | | | | | | | | | | | | | |
| MA-823 | 4.0 | 2.0 | 2.0 | 1.0 | 10.0 | 4.0 | 20.0 | 0.1 | 1.0 | 4.0 | 30.0 | 0.4 | 20.0 | 10.0 | 40.0 | 50.0 | 15.0 | 6.0 | 30.0 |
| MB-823 | 1.0 | 0.6 | 0.4 | 0.2 | 6.0 | 2.0 | 6.0 | 0.06 | 0.6 | 1.0 | 2.0 | 0.1 | 6.0 | 4.0 | 10.0 | 6.0 | 2.0 | 0.4 | 4.0 |
| MA-824 | 2.0 | 2.0 | 2.0 | 0.8 | 20.0 | 4.0 | 20.0 | 0.2 | 0.4 | 2.0 | 30.0 | 0.2 | 20.0 | 12.0 | 20.0 | 40.0 | 10.0 | 4.0 | 40.0 |
| MB-824 | 1.0 | 1.0 | 0.6 | 0.4 | 6.0 | 2.0 | 10.0 | 0.2 | 0.2 | 1.0 | 6.0 | 0.06 | 10.0 | 6.0 | 6.0 | 4.0 | 2.0 | 0.4 | 4.0 |
| MA-825 | 4.0 | 4.0 | 2.0 | 1.0 | 20.0 | 6.0 | 20.0 | 0.2 | 0.6 | 6.0 | 30.0 | 0.2 | 20.0 | 10.0 | 40.0 | 50.0 | 10.0 | 4.0 | 30.0 |
| MB-825 | 0.6 | 1.0 | 0.6 | 0.2 | 6.0 | 2.0 | 6.0 | 0.06 | 0.1 | 2.0 | 2.0 | 0.06 | 6.0 | 2.0 | 10.0 | 10.0 | 2.0 | 0.2 | 2.0 |
| MA-826 | 2.0 | 2.0 | 1.0 | 0.6 | 6.0 | 4.0 | 16.0 | 0.06 | 0.6 | 4.0 | 10.0 | 0.2 | 10.0 | 6.0 | 20.0 | 40.0 | 6.0 | 4.0 | 20.0 |
| MB-826 | 0.6 | 0.6 | 0.4 | 0.4 | 2.0 | 2.0 | 4.0 | 0.06 | 0.1 | 1.0 | 2.0 | 0.06 | 6.0 | 2.0 | 10.0 | 6.0 | 2.0 | 0.2 | 2.0 |
| MA-829 | 1.0 | 1.0 | 0.6 | 0.6 | 2.0 | 2.0 | 8.0 | 0.2 | 0.02 | 1.0 | 10.0 | 0.2 | 10.0 | 6.0 | 20.0 | 40.0 | 6.0 | 2.0 | 12.0 |
| MB-829 | 0.2 | 0.4 | <0.2 | 0.2 | 1.0 | 0.6 | 4.0 | 0.06 | <0.02 | 0.8 | 1.0 | 0.04 | 6.0 | 2.0 | 6.0 | 6.0 | 2.0 | 0.1 | 1.0 |
| MA-830 | 2.0 | 1.0 | 1.0 | 0.4 | 15.0 | 4.0 | 20.0 | 0.2 | 0.4 | 2.0 | 20.0 | 0.2 | 15.0 | 10.0 | 20.0 | 30.0 | 8.0 | 4.0 | 20.0 |
| MB-830 | 0.8 | 0.2 | 0.4 | 0.2 | 4.0 | 2.0 | 6.0 | 0.2 | 0.1 | 0.6 | 2.0 | 0.06 | 6.0 | 4.0 | 6.0 | 4.0 | 2.0 | 0.2 | 2.0 |
| MA-831 | 0.8 | 0.6 | 0.6 | 0.6 | 6.0 | 2.0 | 10.0 | 0.1 | 0.2 | 1.0 | 10.0 | 0.2 | 6.0 | 10.0 | 20.0 | 10.0 | 4.0 | 2.0 | 20.0 |
| MB-831 | 0.2 | 0.2 | 0.2 | <0.2 | 6.0 | 0.6 | 6.0 | <0.06 | 0.06 | 0.6 | 4.0 | <0.1 | 6.0 | 6.0 | 8.0 | 8.0 | 2.0 | 0.2 | 3.0 |
| Pomona | | | | | | | | | | | | | | | | | | | |
| MA-1112 | 0.2 | 0.6 | 0.4 | 0.4 | 6.0 | 1.0 | 8.0 | 0.06 | <0.02 | 0.6 | 10.0 | 0.1 | 10.0 | 4.0 | 10.0 | 30.0 | 6.0 | 1.0 | 8.0 |
| MB-1112 | <0.2 | 0.2 | <0.2 | 0.2 | 2.0 | 1.0 | 6.0 | 0.06 | <0.02 | 0.4 | 1.0 | 0.06 | 6.0 | 2.0 | 6.0 | 6.0 | 2.0 | 0.1 | 1.0 |
| MA-1118 | 0.8 | 0.4 | 2.0 | 0.4 | 1.0 | 1.0 | 10.0 | 0.1 | <0.02 | 0.6 | 6.0 | 0.1 | 10.0 | 4.0 | 10.0 | 30.0 | 4.0 | 1.0 | 10.0 |
| MB-1118 | 0.2 | 0.2 | 0.6 | 0.2 | 2.0 | 1.0 | 4.0 | 0.1 | <0.02 | 0.4 | 1.0 | 0.06 | 6.0 | 1.0 | 6.0 | 6.0 | 1.0 | 0.1 | 1.0 |
| MA-1119 | 0.6 | 0.6 | 0.8 | 0.4 | 2.0 | 0.6 | 10.0 | 0.1 | <0.02 | 0.6 | 6.0 | 0.1 | 6.0 | 2.0 | 10.0 | 20.0 | 2.0 | 0.6 | 4.0 |
| MB-1119 | 0.2 | 0.2 | 0.4 | 0.2 | 1.0 | 0.6 | 6.0 | 0.2 | <0.02 | 0.4 | 1.0 | 0.06 | 4.0 | 1.0 | 6.0 | 6.0 | 1.0 | 0.1 | 1.0 |

TABLE B-1. (Continued)

| Sample[b] | V | Mn | Ni | Cr | Zn | Cu | Pb | B | Ag | Sn | Fe | Sr | Na | K | Ca | Si | Mg | Ti | Al |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Composite Sample of Large Aerosols (>2 μ) – Elements, weight percent | | | | | | | | | | | | | | | | | | |
| Columbus (>2 μ) | 0.01 | 0.1 | 0.03 | 0.04 | 0.1 | 0.01 | 0.4 | 0.003 | 0.0005 | 0.002 | 6.0 | 0.01 | 0.5 | 1.0 | 3.0 | 10.0–20.0 | 2.0 | 0.1 | 3.0 |
| New York (>2 μ) | 0.04 | 0.1 | 0.03 | 0.04 | 0.3 | 0.03 | 0.7 | 0.003 | 0.002 | 0.02 | 3.0 | 0.01 | 1.5 | 1.0 | 6.0 | 10.0–20.0 | 1.0 | 0.3 | 3.0 |

(a) Optical emission spectrometry. Other elements sought but undetected: Be, Cd, As, Sb, Ci, Bi, Co, Ge, Mo, Te, Tn, Zr, Ba. Sample volume ~19 m$^3$.

(b) MA denotes total aerosol collection on Millipore; MB denotes <2 μm aerosol collection on Millipore; numerals denote month-day of collection.

### TABLE B-2. ANALYSES OF AEROSOLS (<2 μm) ON QUARTZ FILTERS

| | Elements/Compounds[(a)], micrograms per filter | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample | Pb | Br | Cl | S | $SO_4^=$ | $NO_3^-$ | $NH_4^+$ |
| **Columbus** | | | | | | | |
| Q-720 | 380 | 220 | 40 | 16,300 | 13,500 | 390 | 3,700 |
| Q-721 | 90 | 102 | 75 | 13,500 | 15,650 | 195 | 4,200 |
| Q-722 | 240 | 180 | 20 | 14,000 | 11,200 | 150 | 4,200 |
| Q-726 | 175 | 110 | 60 | 4,000 | 1,550 | 435 | 460 |
| Q-728 | 140 | 120 | 20 | 11,000 | 7,800 | 600 | 2,600 |
| **New York** | | | | | | | |
| Q-811 | 125 | 55 | 125 | 5,500 | 1,550 | 2,100 | 850 |
| Q-813 | 160 | 50 | 20 | 14,500 | 15,300 | 550 | 4,200 |
| Q-814 | 150 | 30 | 75 | 4,500 | 8,000 | 350 | 1,900 |
| Q-818 | 300 | 130 | 125 | 10,000 | 12,150 | 480 | 2,450 |
| Q-822 | 125 | 43 | 140 | 7,500 | 7,450 | 500 | 1,600 |
| Q-823 | 200 | 35 | 200 | 6,500 | 8,450 | 390 | 2,150 |
| Q-824 | 310 | 40 | 120 | 6,600 | 12,000 | 1,200 | 4,000 |
| Q-825 | 500 | 70 | 140 | 16,000 | 15,100 | 950 | 4,200 |
| Q-826 | 325 | 50 | 80 | 6,500 | 12,200 | 2,400 | 3,600 |
| Q-829 | 150 | 43 | 20 | 10,000 | 6,500 | 240 | 1,800 |
| Q-830 | 200 | 140 | 100 | 4,500 | 1,300 | 400 | 600 |
| Q-831 | 440 | 80 | 120 | 6,600 | – | – | – |
| **Pomona** | | | | | | | |
| Q-1110-1113 | 200 | 141 | 360 | 1,100 | 1,500 | 2,250 | 750 |
| Q-1118 | 350 | 200 | 200 | 2,500 | 4,400 | 8,000 | 3,300 |
| Q-1119 | 325 | 150 | 175 | 2,800 | 6,500 | 10,500 | 4,400 |
| | Composite of Large Aerosols (>2 μm), weight percent | | | | | | |
| Columbus (>2 μm) | 0.2 | 0.06 | 0.8 | 4.8 | 2.2 | 1.6 | 0.07 |
| New York (>2 μm) | 0.3 | 0.08 | 6.2 | 8.2 | 4.0 | 3.3 | 0.12 |

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(a) Analyses for Pb, Br, Cl, S by X-ray fluorescence. Analyses for $SO_4^=$, $NO_3^-$, $NH_4^+$ by wet chemistry. Sample volume ~750 $m^3$.

## TABLE B-3. COMPOSITION OF AEROSOLS (<2 μm) BY ELEMENT CATEGORIES

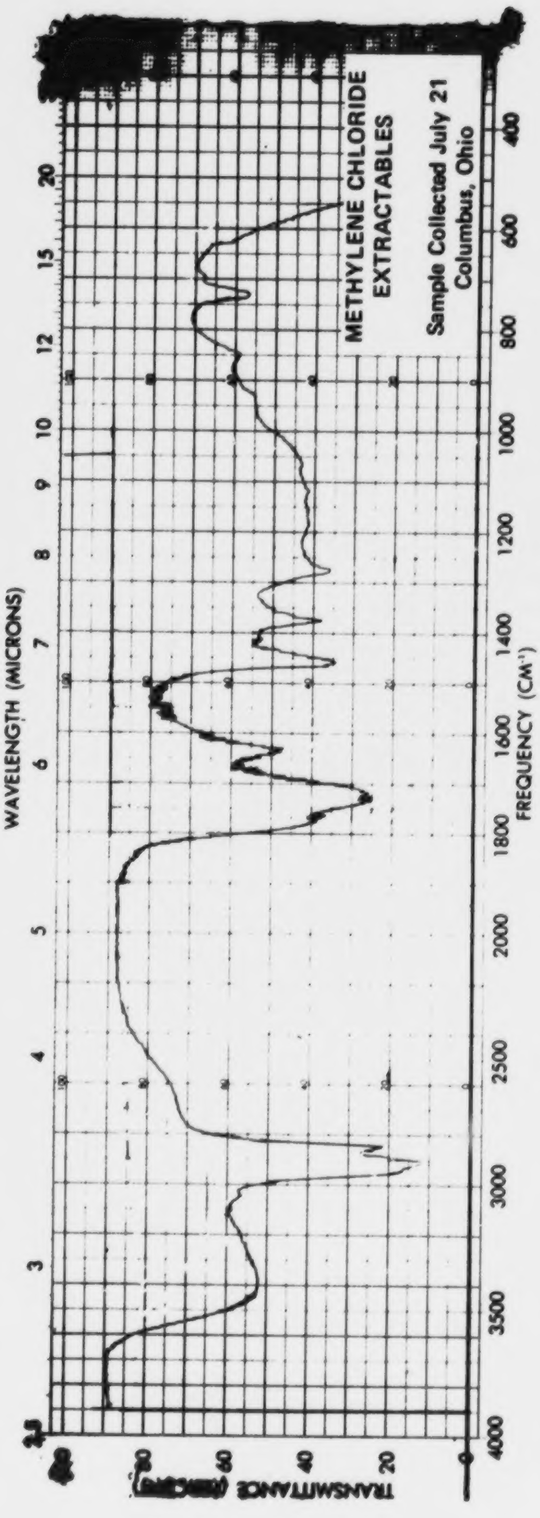
| Sample Date | Percents of Total Mass Loading | | | | | | | Sum of Percents of Total Mass Loading | Total Mass Loading, $\mu g/m^3$ |
|---|---|---|---|---|---|---|---|---|---|
| Mo - Day | Metals | Carbon | Hydrogen | Nitrogen | Sulfur | Halogen | Oxygen[a] | | |
| Columbus | | | | | | | | | |
| 7-20 | 1.1 | 13.7 | 4.6 | 5.8 | 23.1 | 0.4 | 13.1 | 61.8 | 90.7 |
| 7-21 | 0.9 | 14.7 | 4.7 | 7.8 | 24.9 | 0.2 | 19.9 | 73.1 | 69.5 |
| 7-22 | 0.5 | 15.6 | 6.4 | 7.9 | 26.7 | 0.4 | 14.9 | 72.4 | 66.2 |
| 7-26 | 1.8 | 23.7 | 5.0 | 3.0 | 14.1 | 0.6 | 5.2 | 53.4 | 34.6 |
| 7-28 | 1.1 | 17.2 | 9.3 | 7.6 | 31.1 | 0.4 | 16.3 | 83.0 | 45.4 |
| New York | | | | | | | | | |
| 8-11 | 1.8 | 25.8 | 6.2 | 4.9 | 20.6 | 0.6 | 10.1 | 70.0 | 34.3 |
| 8-13 | 1.3 | 21.7 | 6.7 | 8.9 | 30.5 | 0.1 | 22.7 | 91.9 | 60.9 |
| 8-14 | 2.0 | 31.0 | 7.2 | 7.4 | 15.4 | 0.4 | 19.2 | 82.6 | 37.4 |
| 8-18 | 1.7 | 24.8 | 5.1 | 7.4 | 23.1 | 0.4 | 19.8 | 82.3 | 55.6 |
| 8-22 | 0.8 | 25.2 | 5.5 | 6.1 | 22.2 | 0.5 | 16.0 | 76.3 | 43.2 |
| 8-23 | 1.8 | 19.4 | 3.5 | 5.6 | 15.6 | 0.6 | 14.6 | 61.1 | 53.4 |
| 8-24 | 1.7 | 25.5 | 9.2 | 7.9 | 24.2 | 0.3 | 16.5 | 85.3 | 69.8 |
| 8-25 | 1.4 | 22.6 | 5.1 | 7.6 | 27.5 | 0.3 | 18.9 | 83.4 | 74.6 |
| 8-26 | 1.1 | 19.2 | 4.5 | 7.2 | 13.1 | 0.3 | 20.4 | 65.8 | 63.4 |
| 8-29 | 0.9 | 21.2 | 4.3 | 4.8 | 26.0 | 0.2 | 12.0 | 69.4 | 49.3 |
| 8-30 | 1.1 | 30.7 | 7.1 | 3.6 | 13.1 | 0.7 | 26.8 | 83.1 | 43.0 |
| Pomona | | | | | | | | | |
| 11-10-13 | 3.7 | 30.5 | 3.6 | 13.5 | 10.3 | 4.7 | 9.8 | 76.1 | 13.7 |
| 11-18 | 1.1 | 22.3 | 5.6 | 18.1 | 8.0 | 1.3 | 29.5 | 85.9 | 40.0 |
| 11-19 | 0.7 | 21.5 | 4.6 | 20.6 | 7.6 | 0.9 | 33.7 | 89.6 | 46.4 |

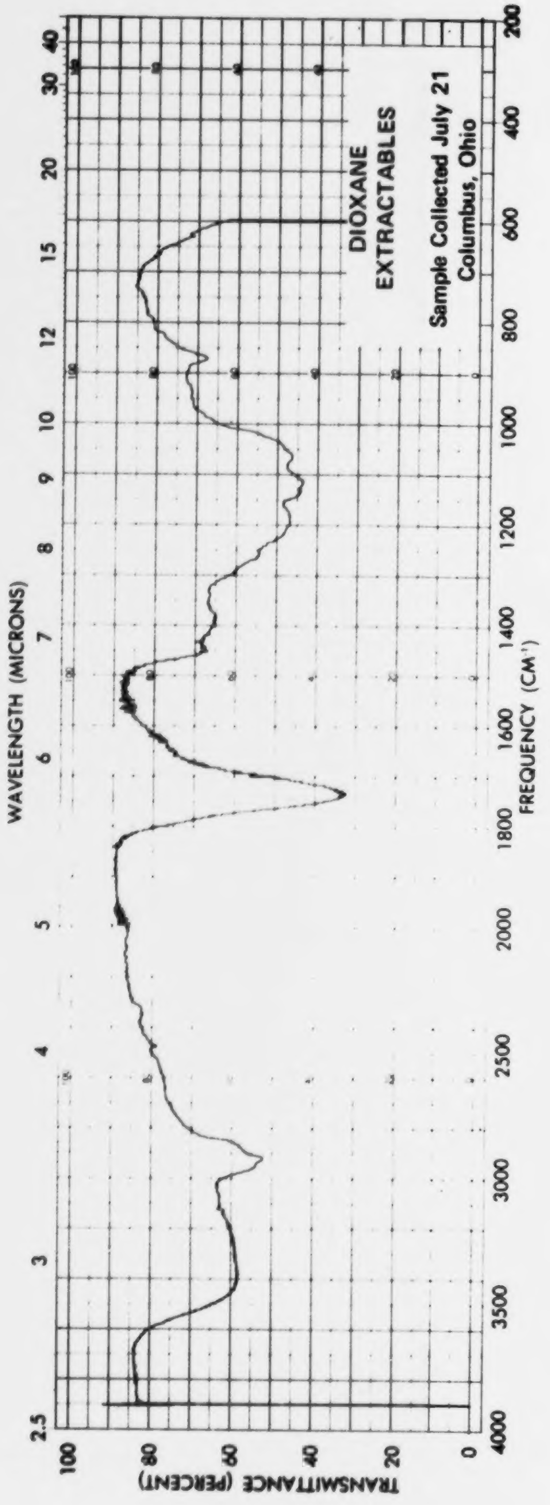
(a) Calculated from the oxygen of nitrate and sulfate only.

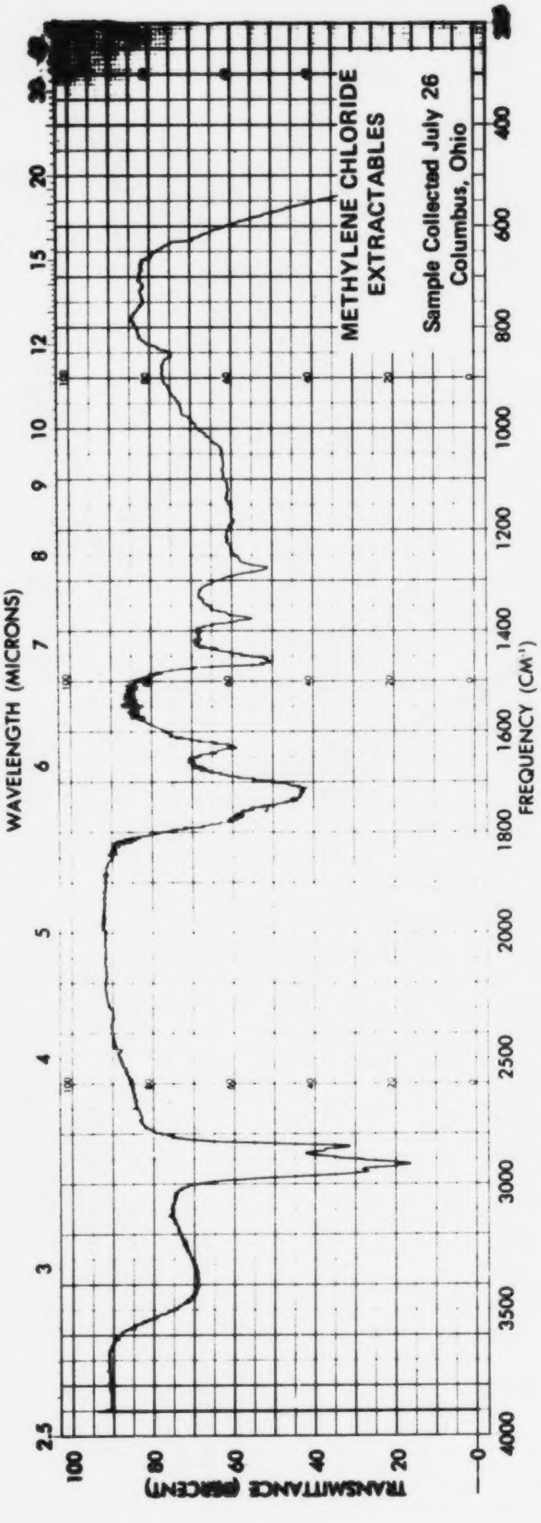
# APPENDIX C

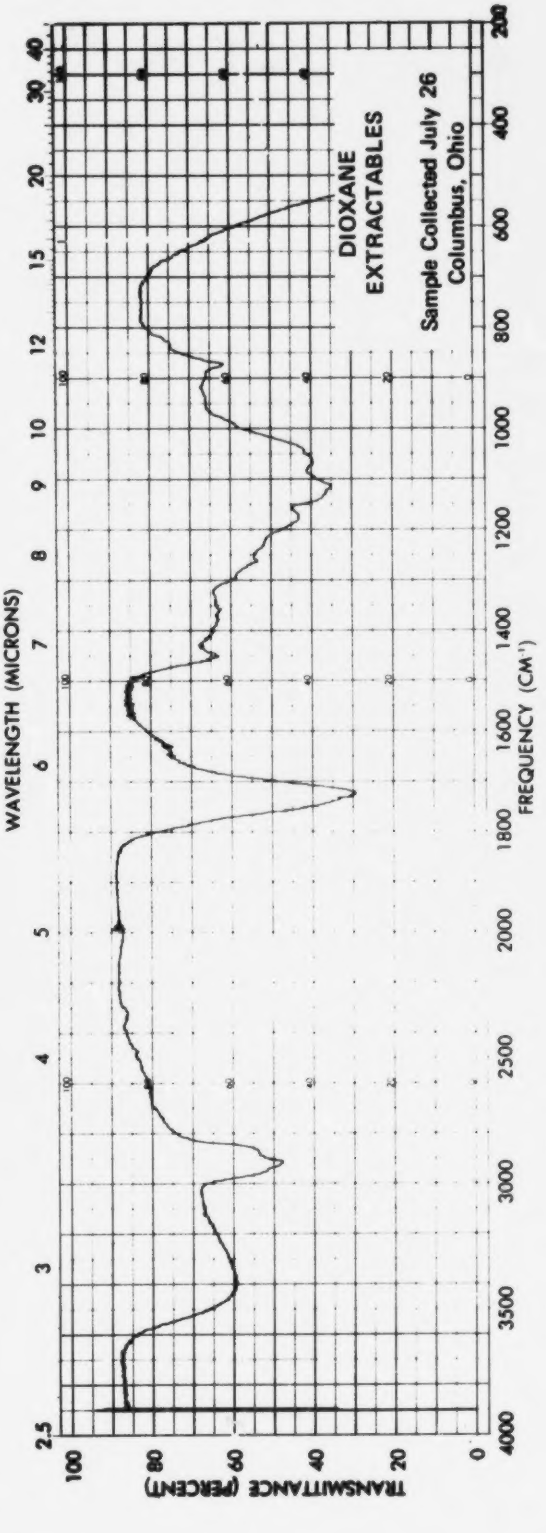
# INFRARED SPECTRA OF SOLVENT EXTRACTABLE PARTICULATE MATTER

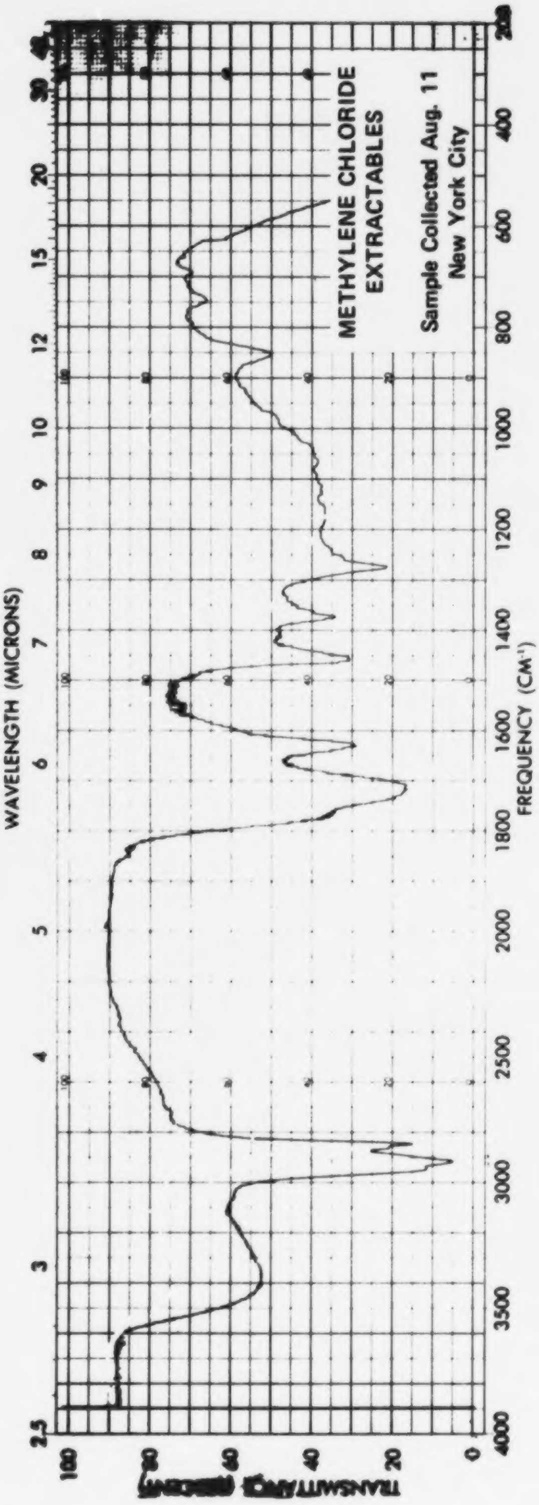
Reproduced from best available copy.

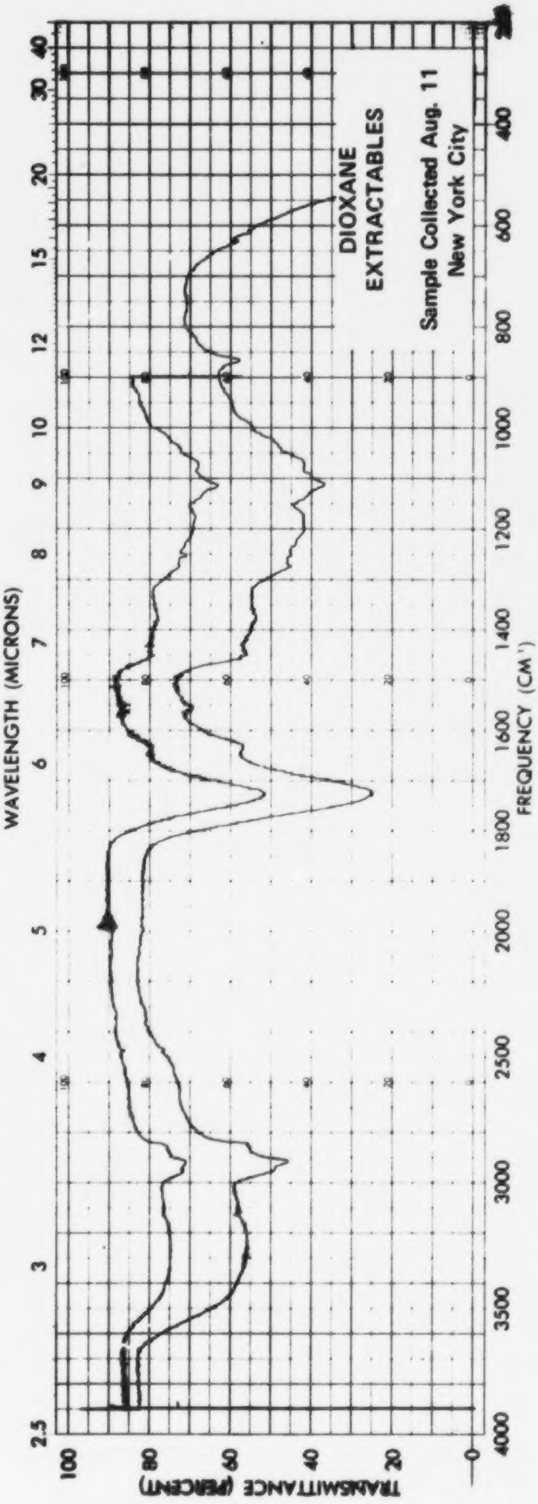


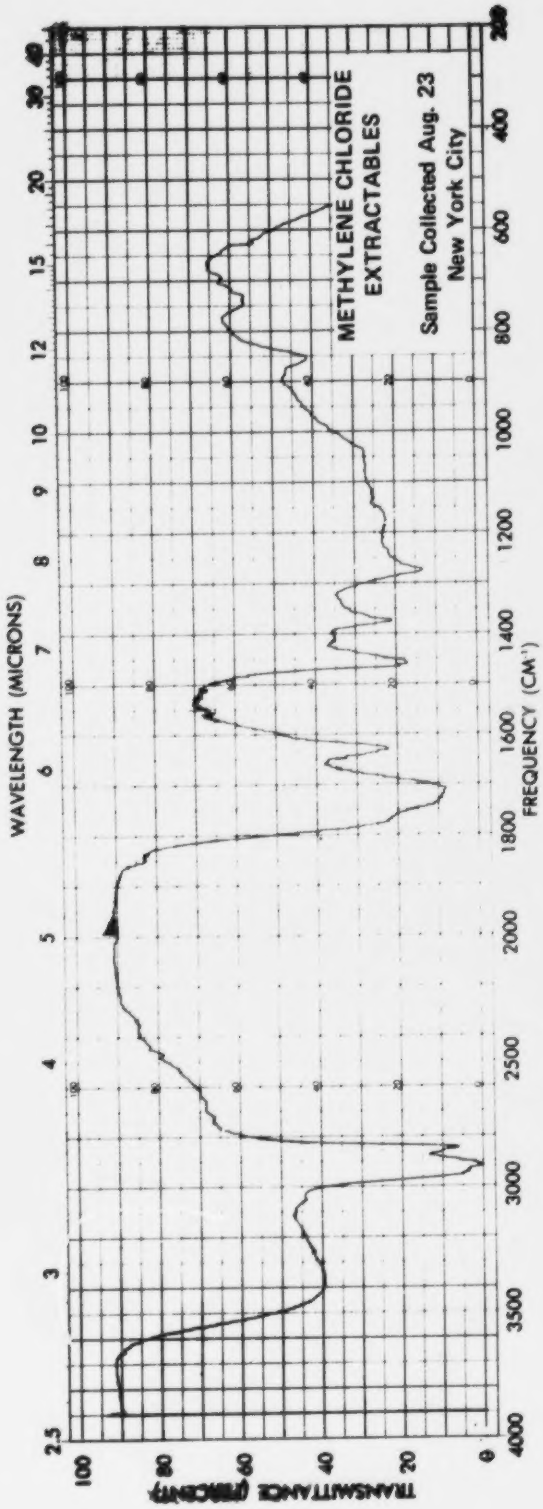


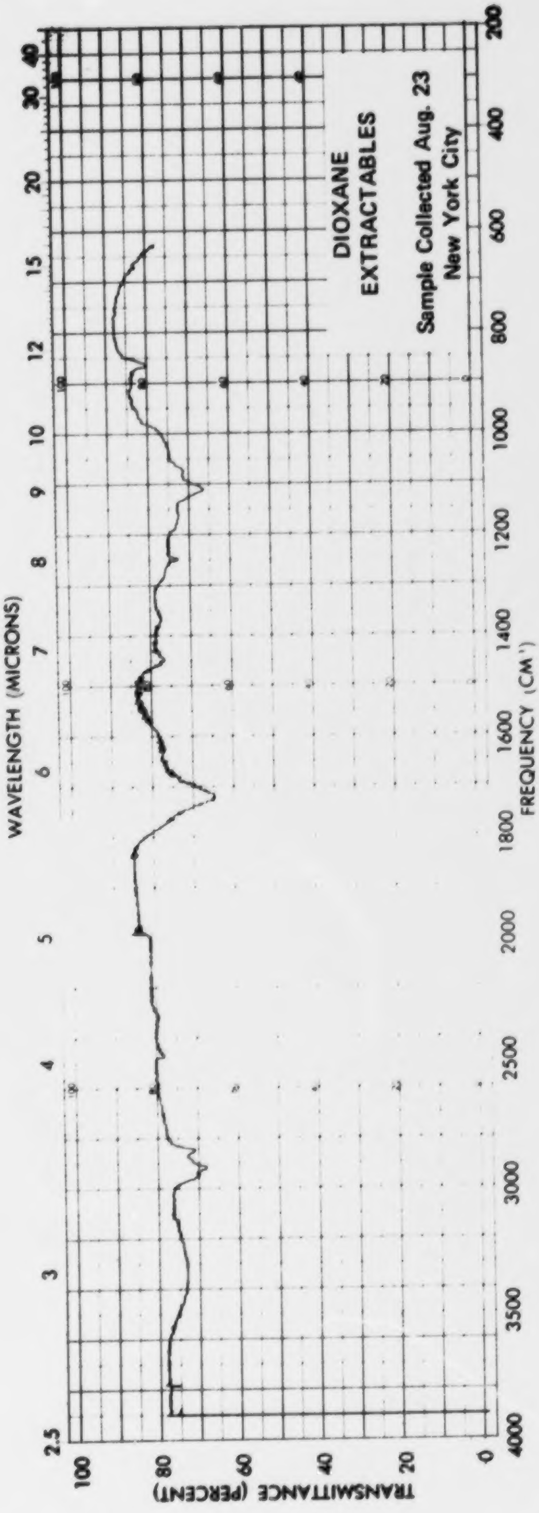

WAVELENGTH (MICRONS)
2.5
3
4
5
6
7
8
9
10
12
15
20
30
40
FREQUENCY (CM⁻¹)
4000
3500
3000
2500
2000
1800
1600
1400
1200
1000
800
600
400
200
TRANSMITTANCE (PERCENT)
100
80
60
40
20
0
METHYLENE CHLORIDE EXTRACTABLES
Sample Collected July 26
Columbus, Ohio

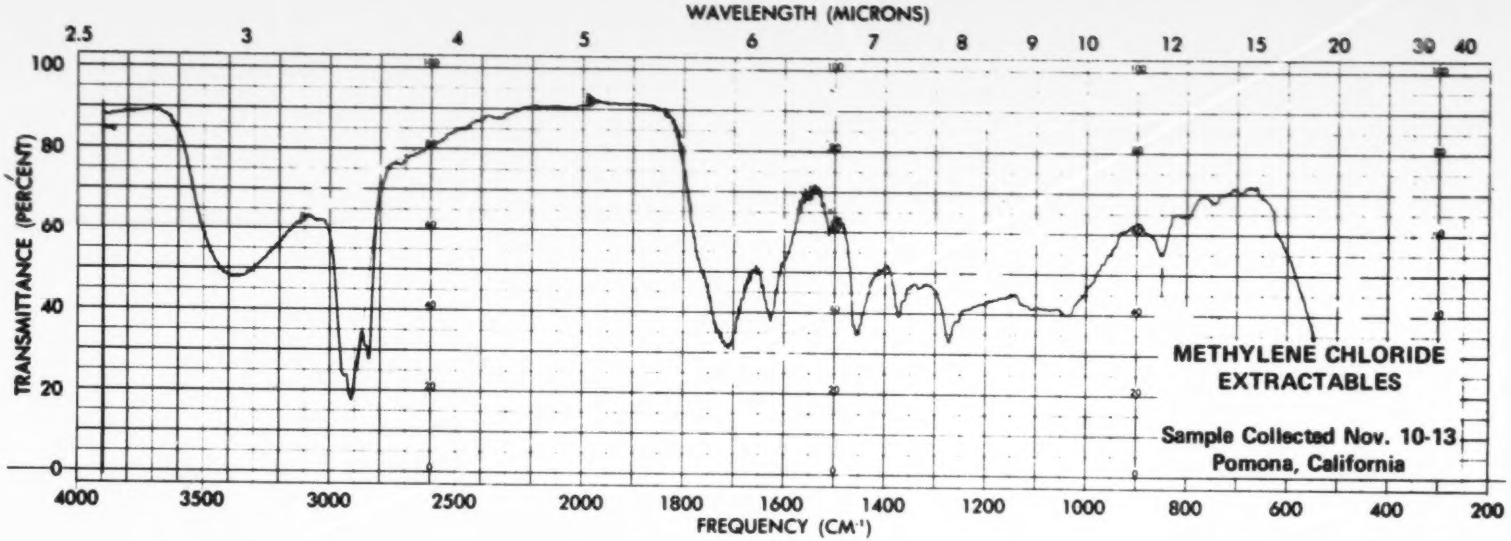

WAVELENGTH (MICRONS)
2.5
3
4
5
6
7
8
9
10
12
15
20
30
40
FREQUENCY (CM⁻¹)
4000
3500
3000
2500
2000
1800
1600
1400
1200
1000
800
600
400
200
TRANSMITTANCE (PERCENT)
100
80
60
40
20
0
DIOXANE EXTRACTABLES
Sample Collected July 26
Columbus, Ohio

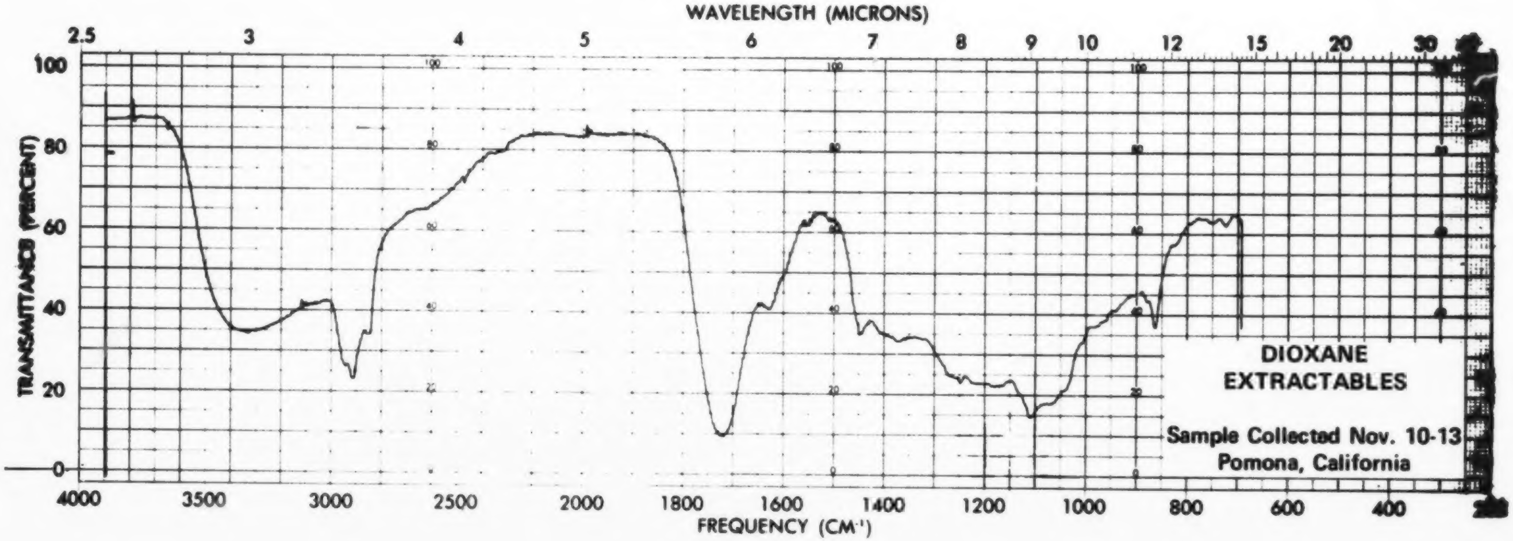

WAVELENGTH (MICRONS)
2.5
3
4
5
6
7
8
9
10
12
15
20
30
40
FREQUENCY (CM⁻¹)
4000
3500
3000
2500
2000
1800
1600
1400
1200
1000
800
600
400
200
TRANSMITTANCE (PERCENT)
100
80
60
40
20
0
METHYLENE CHLORIDE
EXTRACTABLES
Sample Collected Aug. 11
New York City

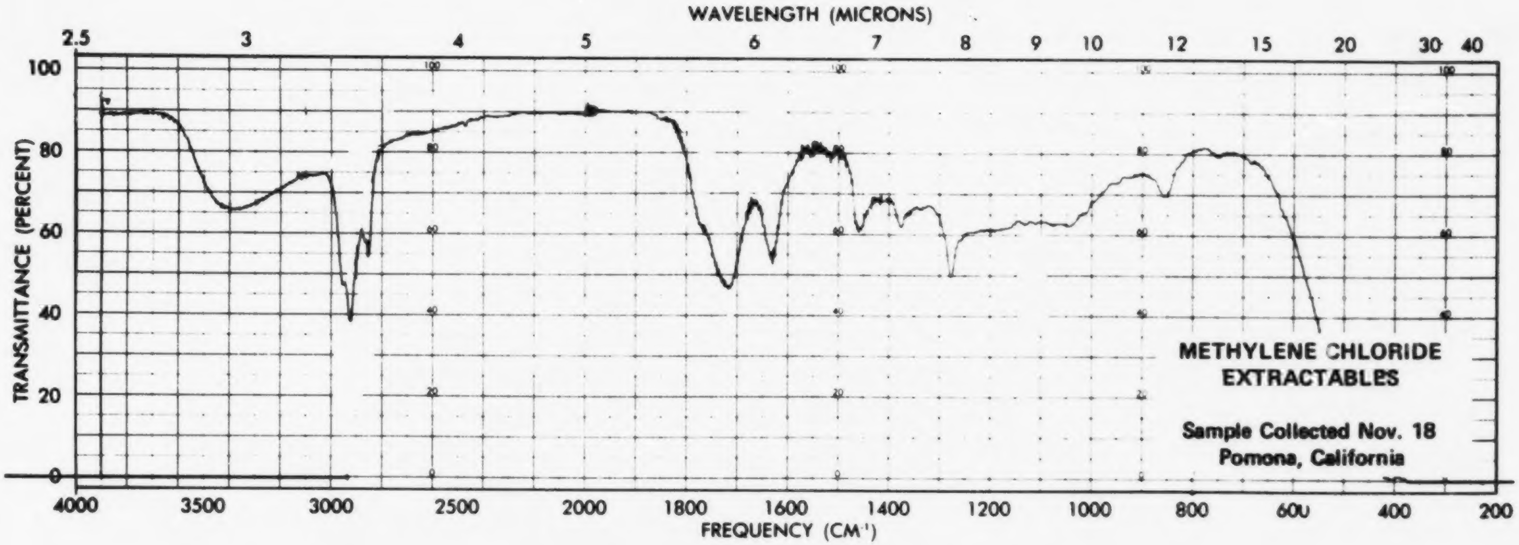

WAVELENGTH (MICRONS)
2.5
3
4
5
6
7
8
9
10
12
15
20
30
40
FREQUENCY (CM⁻¹)
4000
3500
3000
2500
2000
1800
1600
1400
1200
1000
800
600
400
200
TRANSMITTANCE (PERCENT)
100
80
60
40
20
0
DIOXANE
EXTRACTABLES
Sample Collected Aug. 11
New York City


METHYLENE CHLORIDE EXTRACTABLES
Sample Collected Aug. 23
New York City
WAVELENGTH (MICRONS)
2.5
3
4
5
6
7
8
9
10
12
15
20
30
40
FREQUENCY (CM⁻¹)
4000
3500
3000
2500
2000
1800
1600
1400
1200
1000
800
600
400
200
TRANSMITTANCE (PERCENT)
100
80
60
40
20
0


DIOXANE EXTRACTABLES
Sample Collected Aug. 23
New York City
WAVELENGTH (MICRONS)
2.5
3
4
5
6
7
8
9
10
12
15
20
30
40
FREQUENCY (CM⁻¹)
4000
3500
3000
2500
2000
1800
1600
1400
1200
1000
800
600
400
200
TRANSMITTANCE (PERCENT)
100
80
60
40
20
0

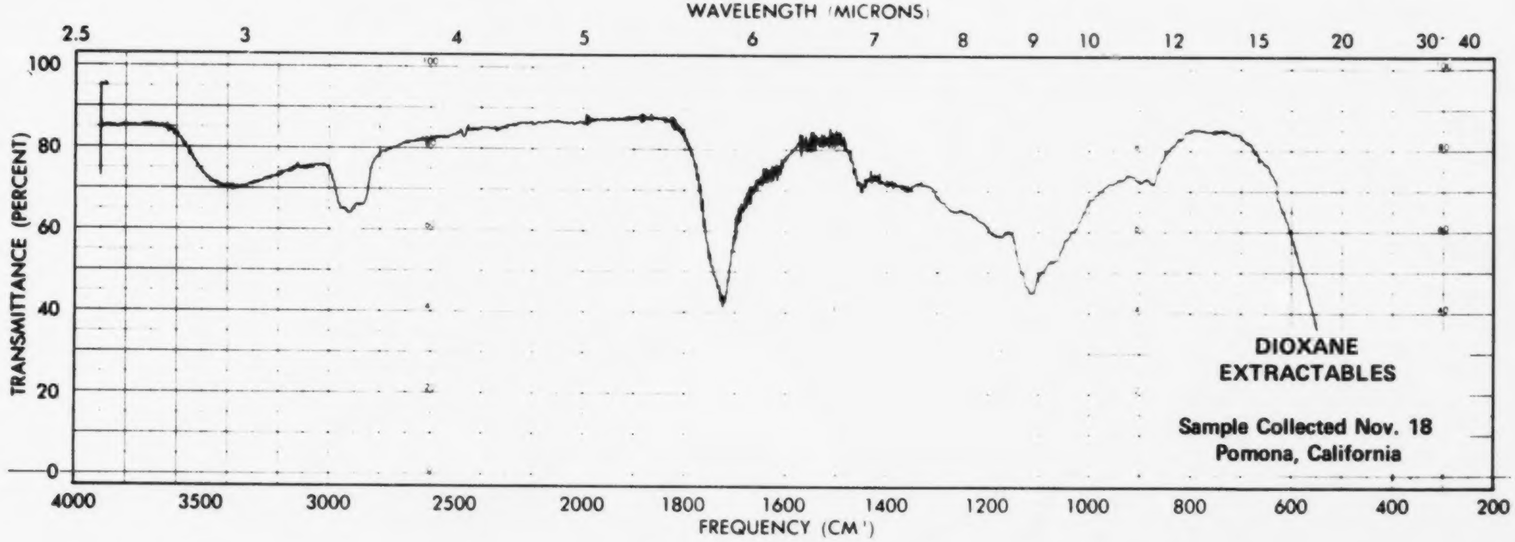

WAVELENGTH (MICRONS)
2.5
3
4
5
6
7
8
9
10
12
15
20
30
40
TRANSMITTANCE (PERCENT)
100
80
60
40
20
0
4000
3500
3000
2500
2000
1800
1600
1400
1200
1000
800
600
400
200
FREQUENCY (CM⁻¹)
METHYLENE CHLORIDE
EXTRACTABLES
Sample Collected Nov. 10-13
Pomona, California


WAVELENGTH (MICRONS)
2.5
3
4
5
6
7
8
9
10
12
15
20
30
TRANSMITTANCE (PERCENT)
100
80
60
40
20
0
4000
3500
3000
2500
2000
1800
1600
1400
1200
1000
800
600
400
FREQUENCY (CM⁻¹)
DIOXANE
EXTRACTABLES
Sample Collected Nov. 10-13
Pomona, California



METHYLENE CHLORIDE EXTRACTABLES

Sample Collected Nov. 18
Pomona, California



DIOXANE EXTRACTABLES

Sample Collected Nov. 18
Pomona, California